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TM 9-1430-250-10

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S MANUAL:

RADAR COURSE DIRECTING CENTRAL (NIKE-HERCULES AIR DEFENSE GUIDED MISSILE SYSTEM) (U)

The classification was changed by change 4 to -- CONFIDENTIAL Modified Handling Authorized.

This copy is a reprint which includes current pages from changes 1 through 16. Pages applying to all systems are inserted in proper numerical order in the manual. Pen and ink changes have been made. Pages which have different effectivities are inserted in the front of the manual. Read the instructions concerning these pages before using the manual.

This material contains information affecting the National Defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.

HEADQUARTERS, DEPARTMENT OF THE ARMY
DECEMBER 1958

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READ THESE INSTRUCTIONS CAREFULLY

1 (U). These instructions pertain only to those pages which have different effectivities.

2 (U). The effectivity columns in paragraph 3 indicate the production cut-in serial number of materiel which has been modified, and the DA MWO which contains instructions for modifying existing materiel produced prior to this production cut-in serial number. Process these pages as follows:

a. If the serial number of the materiel in use is of the applicable production cut-in serial number or higher, apply changes as indicated in paragraph 3.

b. If the serial number of the materiel in use is below the applicable production cut-in serial number, and the pertinent DA MWO has been accomplished, apply changes as indicated in paragraph 3.

c. If the serial number of the materiel in use is below the applicable production cut-in serial number, but the pertinent DA MWO has not been accomplished, do not change the manual until such time as the modification is completed. Retain the change pages with this instruction sheet in the front of the manual. After the modification is completed, apply the changes as indicated in paragraph 3.

3 (U). In accordance with the instructions contained in paragraph 2, the new pages, as enumerated below, will be inserted in the manual, and the old pages will be removed. The material on a new or revised page affected by these changes is indicated by a vertical line in the margin of the page. Added or revised illustrations are indicated by a vertical line adjacent to the RA PD or ORD G number.

Old pages	New pages	Effectivity	
		DA MWO	Production cut-in serial no.
17-20, 20.1	17-20, 20.1	9-1400-250-30/40	1394
131-134	131-134	9-1400-250-50/43	1394
207-210	207-210	9-1400-262-30	1363
261-264, 264.1	261-264, 264.1	9-1400-262-30	1363
339-342	339-342	9-1400-262-30	1363
None	371-378	9-1430-253-50/2	1386

4 (U). C12 rescinded pages 371-428, and "Next numbered page is 429" appears at the bottom of page 370.2. C15 added pages 371-378, which are to be incorporated after the accomplishment of DA MWO 9-1430-253-50/2, in accordance with the instruction sheet. "Next numbered page is 429" should then appear at the bottom of page 378. In the table of contents, chapter 7, add the new sections IV, V, and VI and their titles (pages 371-378).

5 (U). Retain the instruction sheets in the front of the manual for future reference.

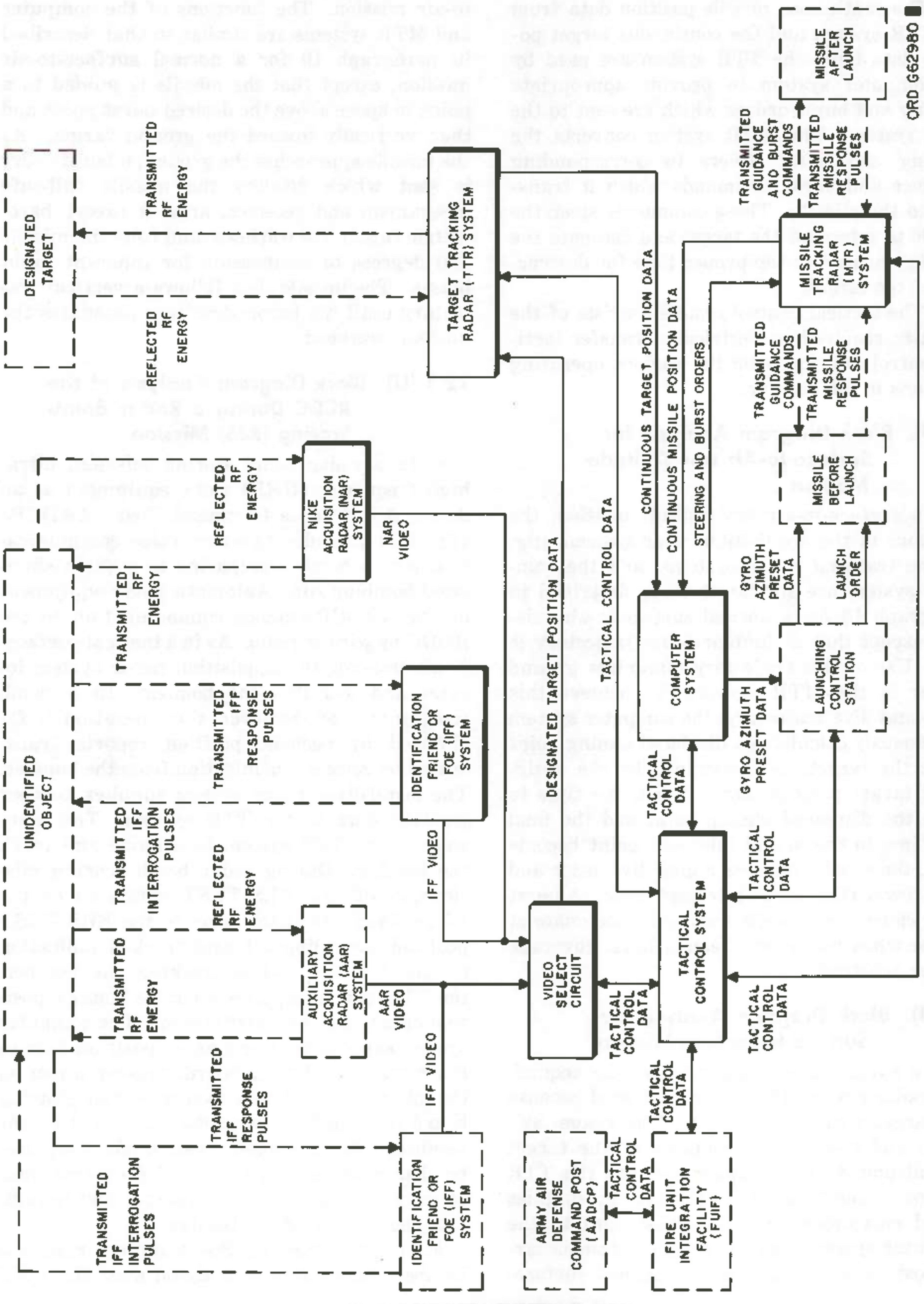


Figure 5 (U). Radar course directing central—functional block diagram (U).

f. The continuous missile position data from the MTR system and the continuous target position data from the TTR system are used by the computer system to provide appropriate steering and burst orders which are sent to the MTR system. The MTR system converts the steering and burst orders to corresponding guidance and burst commands which it transmits to the missile. These commands steer the missile to intercept the target and detonate the missile warhead at the proper time for destruction of the target.

g. The tactical control system consists of the facilities required to electrically transfer tactical control data between the various operating positions in the battery.

11 (U). Block Diagram Analysis for Surface-to-Air Low Altitude Mission

In a surface-to-air low altitude mission, the functions of the acquisition radar systems (fig. 5), the tracking radar systems, and the computer system are similar to those described in paragraph 10 for a normal surface-to-air mission, except that a climb-and-dive trajectory is used. Use of this trajectory minimizes ground clutter in the MTR system. To achieve this climb-and-dive trajectory, the computer system continuously calculates a displaced aiming point above the target, as determined by the designated target position data. When the time to reach the displaced aiming point and the final dive time to the actual intercept point become equal, the missile receives a final dive order and dives toward the actual intercept point. A burst order causes the missile warhead to detonate at a time when the most effective burst coverage will be achieved.

12 (U). Block Diagram Analysis for Surface-to-Surface Mission

In a surface-to-surface mission, the acquisition radar system (fig. 5) are not used because the target position is known. The range, azimuth, and elevation coordinates of the target are calculated and manually set into the TTR system. Therefore, the TTR system supplies locked coordinate target position data to the computer system instead of the continuous target position data supplied in a normal surface-to-air mission. The functions of the computer and MTR systems are similar to that described in paragraph 10 for a normal surface-to-air mission, except that the missile is guided to a point in space above the desired burst point and then vertically toward the ground target. As the missile approaches the ground, a burst order is sent which disables the missile fail-safe mechanism and receiver, arms a preset barometric fuze in the warhead, and rolls the missile 180 degrees to compensate for inherent flight biases. The missile then follows a vertical trajectory until the barometric fuze detonates the nuclear warhead.

12.1 (U). Block Diagram Analysis of the RCDC During a Radar Bomb Scoring (RBS) Mission

a. In a radar bomb scoring mission, ultrahigh frequency (UHF) radio equipment at an Army Air Defense Command Post (AADCP) (fig. 5.1) provides two-way voice communication with a bomber preparing to make a simulated bombing run. Automatic relay equipment at the AADCP extends communication to the RCDC by wire or radio. As in a tactical surface-to-air mission, the acquisition radar system locates and identifies the bomber. In a bomb scoring mission, however, this operation is facilitated by periodic position reports transmitted by voice communication from the bomber. The acquisition radar system supplies bomber position data to the TTR system. This data enables the TTR system to acquire and track the bomber. During radar bomb scoring missions, NORMAL–RBS TEST switch S1 on the FUIF fixed attenuator is set to the RBS TEST position, providing a target tracked indication to the AADCP. While tracking the bomber, the TTR system supplies accurate bomber position data to the computer system. The computer system supplies bomber ground position data to the horizontal plotting board, causing a pen on the plotting board to travel over the plotting board in accordance with the movement of the bomber. The computer system also supplies bomber altitude data to the RBS control unit, causing an altimeter on the control unit to indicate the altitude of the bomber.

b. At the start of the bombing run, the bomber transmits a tone signal over the UHF

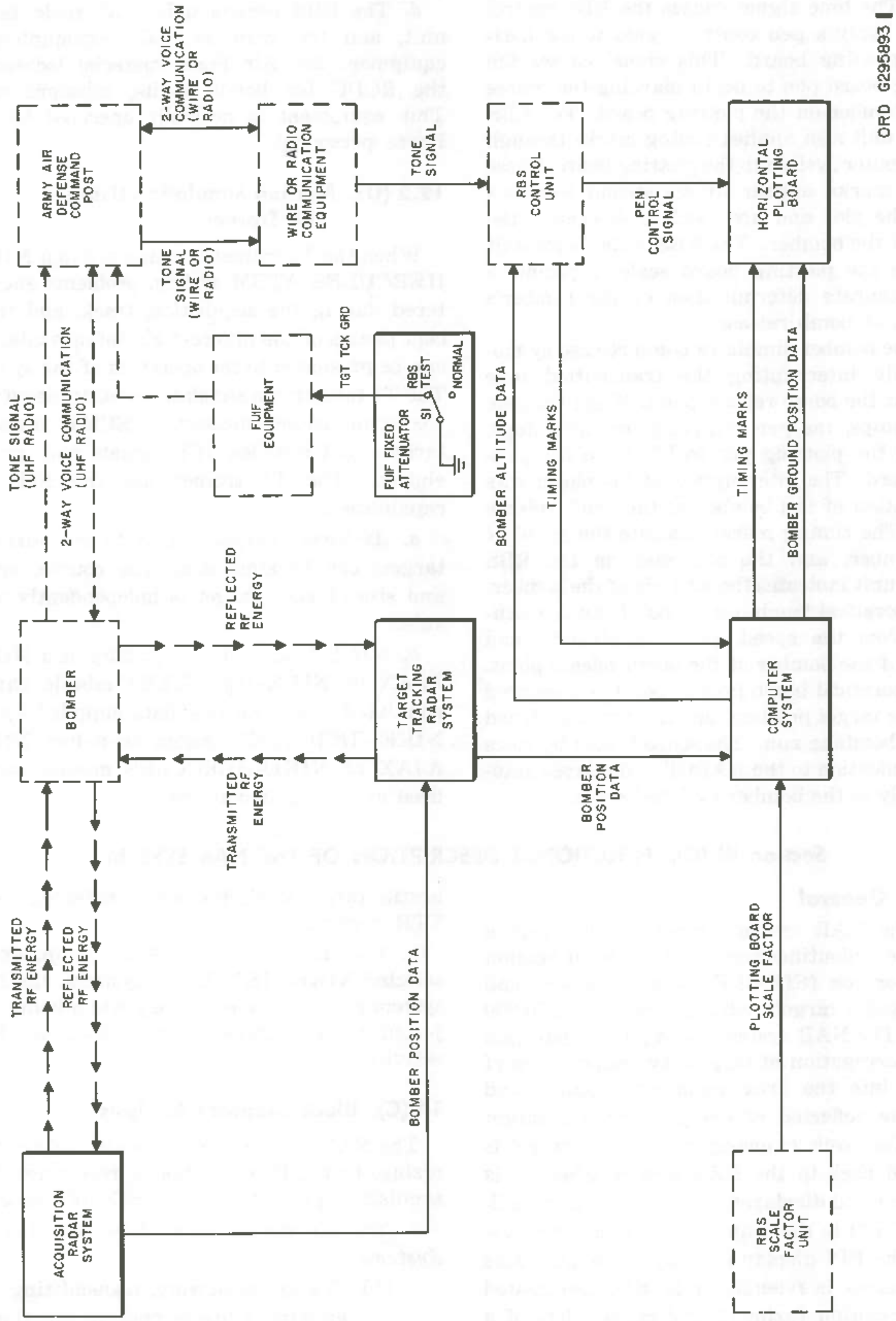


Figure 5.1 (U). Radar course directing central—radar bomb scoring mission—block diagram (U).

radio. The tone signal causes the RBS control unit to apply a pen control signal to the horizontal plotting board. This signal causes the plotting board pen to begin marking the course of the bomber on the plotting board. The RBS control unit also applies timing marks through the computer system to the plotting board. These timing marks appear at six-second intervals along the plot and are used to determine the speed of the bomber. The RBS scale factor unit expands the plotting board scale to permit a more accurate determination of the bomber's position at bomb release.

c. The bomber simulates bomb release by momentarily interrupting the transmitted tone signal at the bomb release point. When the tone signal stops, the pen control signal also stops, causing the plotting pen to lift from the plotting board. The interruption of the plot marks the location of the bomber at the bomb release point. The timing marks indicate the speed of the bomber, and the altimeter on the RBS control unit indicates the altitude of the bomber. The theoretical bomb impact point can be calculated from the speed, position, altitude, and course of the bomber at the bomb release point. The theoretical bomb impact point is compared with the target position, and a score is assigned for the bombing run. The scope is sent by voice communication to the AADCP and relayed automatically to the bomber by UHF radio.

d. The RBS control unit, RBS scale factor unit, and the wire or radio communication equipment are Air Force material located in the RCDC for bomb scoring missions only. This equipment is normally operated by Air Force personnel.

12.2 (U). Mission Simulation Using T1 Trainer

When the T1 trainer is connected to a NIKE–HERCULES ATBM system, problems encountered during the acquisition, track, and intercept phases of the different air defense missions can be presented to the operators of the system. The T1 trainer can simulate low altitude effects, electronic countermeasures (ECM), airborne targets and missiles, IFF signals and ground clutter. The T1 trainer has the following capabilities.

a. Airborne Targets. One to six airborne targets can be simulated. The course, speed, and size of each target is independently variable.

b. NIKE Missile. The trajectory of a NIKE–AJAX or NIKE–HERCULES missile can be simulated from tracking data supplied by the NIKE–HERCULES system or a live NIKE–AJAX or NIKE–HERCULES missile can be fired at a simulated target.

Section III (C). FUNCTIONAL DESCRIPTION OF THE NAR SYSTEM

13 (U). General

a. The NAR system, in conjunction with a selective identification feature/identification friend or foe (SIF/IFF) system, detects and interrogates targets within a range of 250,000 yards. The NAR system accomplishes detection and interrogation of targets by transmitting rf energy into the area under surveillance, and receiving reflected rf energy. When a target enters this area, rf energy striking the target is reflected back to the NAR system where it is amplified and displayed on a plan position indicator (PPI) in the acquisition presentation system. The PPI display is analyzed to determine if the target is friendly or hostile. Designated target position (azimuth and range) data of a hostile target is electrically transferred to the TTR system.

b. With the addition of AJD equipment, in selected NIKE–HERCULES systems, the NAR system can operate effectively while being subjected to an extremely high level of ECM activity.

14 (C). Block Diagram Analysis

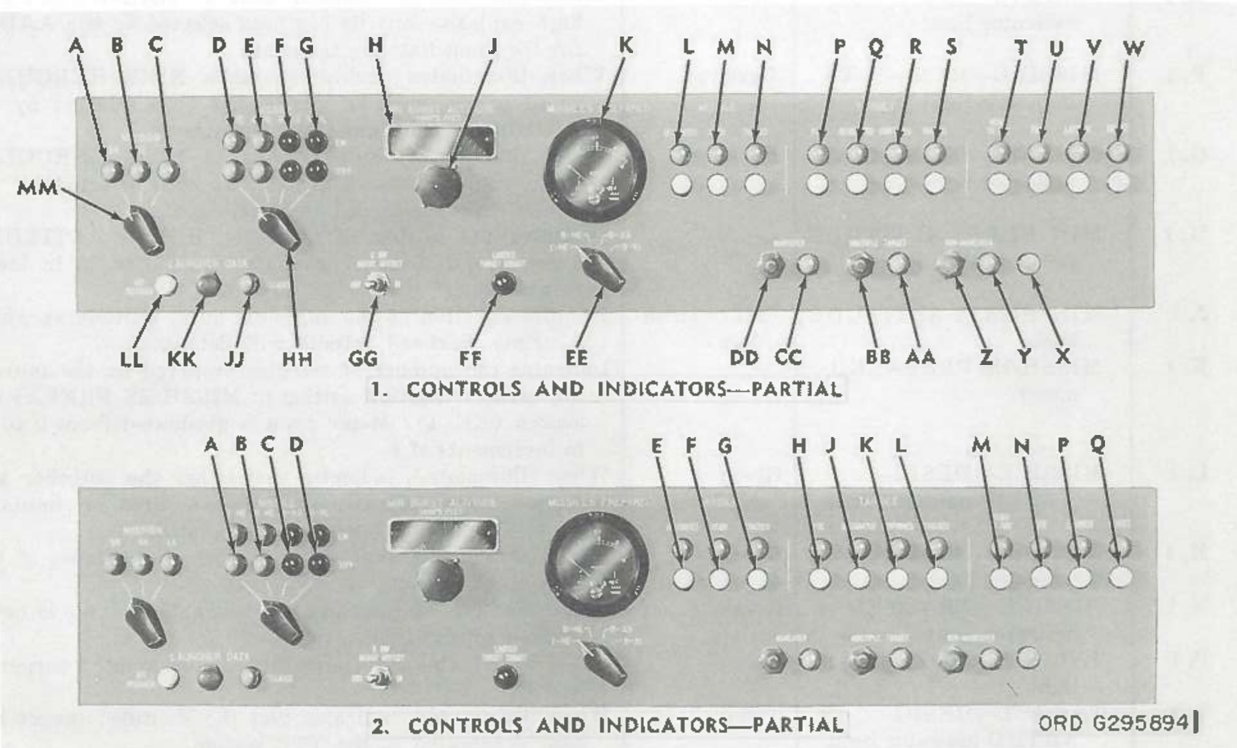
The NAR system (fig. 6) consists of synchronizing, transmitting, antenna, receiving, MTI, acquisition presentation, and SIF/IFF systems.

a. Synchronizing, Transmitting, and Antenna Systems.

(1) The synchronizing, transmitting, and antenna systems operate together to

originate and transmit pulses of rf energy into space. The synchronizing system initiates a NAR preknock pulse, a NAR sync pulse, and a transmitter sync pulse, which electrically synchronize the operation of the transmitting, receiving, moving target indicator (MTI), SIF/IFF, acquisition presentation, and TTR systems. The transmitter sync pulse is applied to the transmitting system. The NAR sync pulse is applied to the acquisition presentation system. The NAR preknock pulse is applied to the receiving, MTI, SIF/IFF, acquisition presentation, and TTR systems.

(2) The transmitter sync pulse is used to trigger the transmitting system which produces high power rf for application to the antenna system. The NAR antenna focuses the high power rf into a narrow (pencil) beam and directs this rf energy to search the area under surveillance. The antenna drive rotates the NAR antenna 360 degrees in azimuth. The reflected rf energy from



1. CONTROLS AND INDICATORS—PARTIAL

2. CONTROLS AND INDICATORS—PARTIAL

Figure 77 (U). Battery signal panel-indicator—controls and indicators (U).

Key to fig. 77	Control or indicator	Type	Function
A, 1	MISSION—SS indicator light	Green	When illuminated, indicates that a surface-to-surface (SS) mission has been selected for the immediate engagement.
B, 1	MISSION—SA indicator light	Green	When illuminated, indicates that a surface-to-air (SA) mission has been selected for the immediate engagement.
C, 1	MISSION—LA indicator light	Green	When illuminated, indicates that a surface-to-air low altitude (LA) mission has been selected for the immediate engagement.
D, 1	MISSILE—REM—I-HE indicator light	Green	When illuminated, indicates that a NIKE-AJAX high explosive missile has been selected by the Army Air Defense Command Post (AADCP) for the immediate engagement.
E, 1	MISSILE—REM—B-HE indicator light	Green	When illuminated, indicates that a NIKE-HERCULES high explosive missile has been selected by the AADCP for the immediate engagement.
F, 1	MISSILE—REM—B-XS indicator light	Dark red	When illuminated, indicates that a NIKE-HERCULES small prime warhead missile has been selected by the AADCP for the immediate engagement.
G, 1	MISSILE—REM—B-XL indicator light	Dark red	When illuminated, indicates that a NIKE-HERCULES large prime warhead missile has been selected by the AADCP for the immediate engagement.
H, 1	MIN. BURST ALTITUDE 1000's FEET dial	—	Indicates the setting of the MIN. BURST ALTITUDE knob (J, 1). Dial is graduated from 0 to 30 in increments of 0.5.
J, 1	MIN. BURST ALTITUDE knob	Rotary (with lock)	Permits selection of the minimum burst altitude at which a prime warhead missile will detonate.
K, 1	MISSILES PREPARED meter	—	Indicates the number of missiles prepared by the launching area for current setting of MISSILES PREPARED switch (EE, 1). Meter scale is graduated from 0 to 16 in increments of 1.
L, 1	MISSILE—DESIGNATED indicator light	Green	When illuminated, indicates that either the launcher and section from which the missile is to be fired, or simulator group OA-1643/M has been designated.
M, 1	MISSILE—READY indicator light	Green	When illuminated, indicates a degree of readiness of the designated missile.
N, 1	MISSILE—TRACKED indicator light	Green	When illuminated, indicates the designated missile is being tracked by the MTR system.
P, 1	TARGET—FOE indicator light	Green	When illuminated, indicates that the designated target is hostile.
Q, 1	TARGET—DESIGNATED indicator light	Green	When illuminated, indicates that the identified target has been designated to the TTR system.
R, 1	TARGET—CONFIRMED indicator light	Green	When illuminated, indicates the designated target is being acquired by the TTR system.
S, 1	TARGET—TRACKED indicator light	Green	When illuminated, indicates the acquired target is being tracked by the TTR system.
T, 1	READY TO FIRE indicator light	Green	When illuminated, indicates that the designated missile may be fired at any time.
U, 1	FIRE indicator light	Green	When illuminated, indicates that the fire order has been issued.
V, 1	LAUNCH indicator light	Green	When illuminated, indicates that the designated missile has been launched.
W, 1	BURST indicator light	Green	When illuminated, indicates that the burst order has been issued.
X, 1	SIMULATE indicator light	Ivory	When illuminated, indicates that the missile firing simulator equipment is in operation or that the test responder in the launching area has been designated.
Y, 1	NON-MANEUVER indicator light	Green	When illuminated, indicates that the computer system is conditioned for a single target that is expected to maneuver little or none at all.

Key to fig. 77	Control or indicator	Type	Function
Z, 1	NON-MANEUVER switch	Pushbutton	When depressed, prepares the computer system for a single target that is expected to maneuver little or none at all. Illuminates NON-MANEUVER indicator light (Y, 1).
AA, 1	MULTIPLE TARGET indicator light	Green	When illuminated, indicates that the computer system is so conditioned that the tracking information from a formation is smoothed out and acted upon as single target information to provide reliable target velocity information.
BB, 1	MULTIPLE TARGET switch	Pushbutton	When depressed, conditions the computer system so that the tracking information from a formation is smoothed out and acted upon as single target information to provide reliable target velocity information. Also illuminates MULTIPLE TARGET indicator light (AA, 1).
CC, 1	MANEUVER indicator light	Green	When illuminated, indicates that the computer system is conditioned for a target that is expected to maneuver evasively.
DD, 1	MANEUVER switch	Pushbutton	When depressed, conditions the computer system for a target that is expected to maneuver evasively. Also illuminates MANEUVER indicator light (CC, 1).
EE, 1	MISSILE PREPARED switch	Rotary (four-position)	When set, the number of prepared missiles of the type indicated by its position is indicated on the MISSILES PREPARED meter (K, 1).
FF, 1	LIMITED TARGET DAMAGE indicator light	Dark red	When illuminated, indicates that the designated target is located such a distance below the minimum burst altitude that the full burst effect from a prime warhead missile cannot be obtained.
GG, 1	B-XW-BURST OFFSET switch	Toggle (two-position)	When set to OUT position, disables the normal burst-offset circuits of the computer system and causes the missile prime warhead to detonate directly on or a short distance from the target. When set to IN position, detonates the missile prime warhead at a distance from the target as determined by the burst-offset circuits of the computer system.
HH, 1	MISSILE switch	Rotary (four-position)	Permits selection of the type missile (I-HE, B-HE, B-XS, or B-XL) to be used for a particular engagement.
JJ, 1	LAUNCHER DATA—RELEASED indicator light	Green	When illuminated, indicates that the mission and missile information, established by the setting of the MISSION switch (MM, 1) and the MISSILE switch (HH, 1) has been released to the launching area.
KK, 1	LAUNCHER DATA switch	Pushbutton	When depressed, releases the mission and missile information established by the setting of the MISSION switch (MM, 1) and the MISSILE switch (HH, 1) to the launching area. Illuminates LAUNCHER DATA RELEASED indicator light (JJ, 1).
LL, 1	LAUNCHER DATA—NOT RELEASED indicator light	Ivory	When illuminated, indicates that no missile or mission data has been released to the launching area.
MM, 1	MISSION switch	Rotary (three-position)	Permits selection of the type mission (SS, surface-to-surface; SA, surface-to-air; or LA, surface-to-air low altitude) for a particular engagement.
A, 2	MISSILE—BTRY—I-HE indicator light	Green	When illuminated, indicates that a NIKE-AJAX high explosive missile has been selected by the battery for the immediate engagement.
B, 2	MISSILE—BTRY—B-HE indicator light	Green	When illuminated, indicates that a NIKE-HERCULES high explosive missile has been selected by the battery for the immediate engagement.

Key to fig. 77	Control or indicator	Type	Function
C, 2	MISSILE—BTRY—B–XS indicator light	Dark red	When illuminated, indicates that a NIKE–HERCULES small prime warhead missile has been selected by the battery for the immediate engagement.
D, 2	MISSILE—BTRY—B–XL indicator light	Dark red	When illuminated, indicates that a NIKE–HERCULES large prime warhead missile has been selected by the battery for the immediate engagement.
E, 2	MISSILE—DESIGNATED indicator light	Ivory	When illuminated, indicates that neither the launcher and section from which the missile is to be fired, nor the flight simulator group has been designated.
F, 2	MISSILE—READY indicator light	Ivory	When illuminated, indicates that the designated missile or flight simulator group is not ready to be tracked.
G, 2	MISSILE—TRACKED indicator light	Ivory	When illuminated, indicates that neither a missile nor the flight simulator group is being tracked by the MTR system.
H, 2	TARGET—FOE indicator light	Ivory	When illuminated, indicates that no target has currently been identified as hostile.
J, 2	TARGET—DESIGNATED indicator light	Ivory	When illuminated, indicates that no target has been designated to the TTR system.
K, 2	TARGET CONFIRMED indicator light	Ivory	When illuminated, indicates that no target has been acquired by the TTR system.
L, 2	TARGET—TRACKED indicator light	Ivory	When illuminated, indicates that no target is currently being tracked by the TTR system.
M, 2	READY TO FIRE indicator light	Ivory	When illuminated, indicates that the events necessary to be performed prior to firing have not taken place.
N, 2	FIRE indicator light	Ivory	When illuminated, indicates that the fire order has not been issued.
P, 2	LAUNCH indicator light	Ivory	When illuminated, indicates that a missile has not been launched for the current engagement.
Q, 2	BURST indicator light	Ivory	When illuminated, indicates that no burst order has been issued.

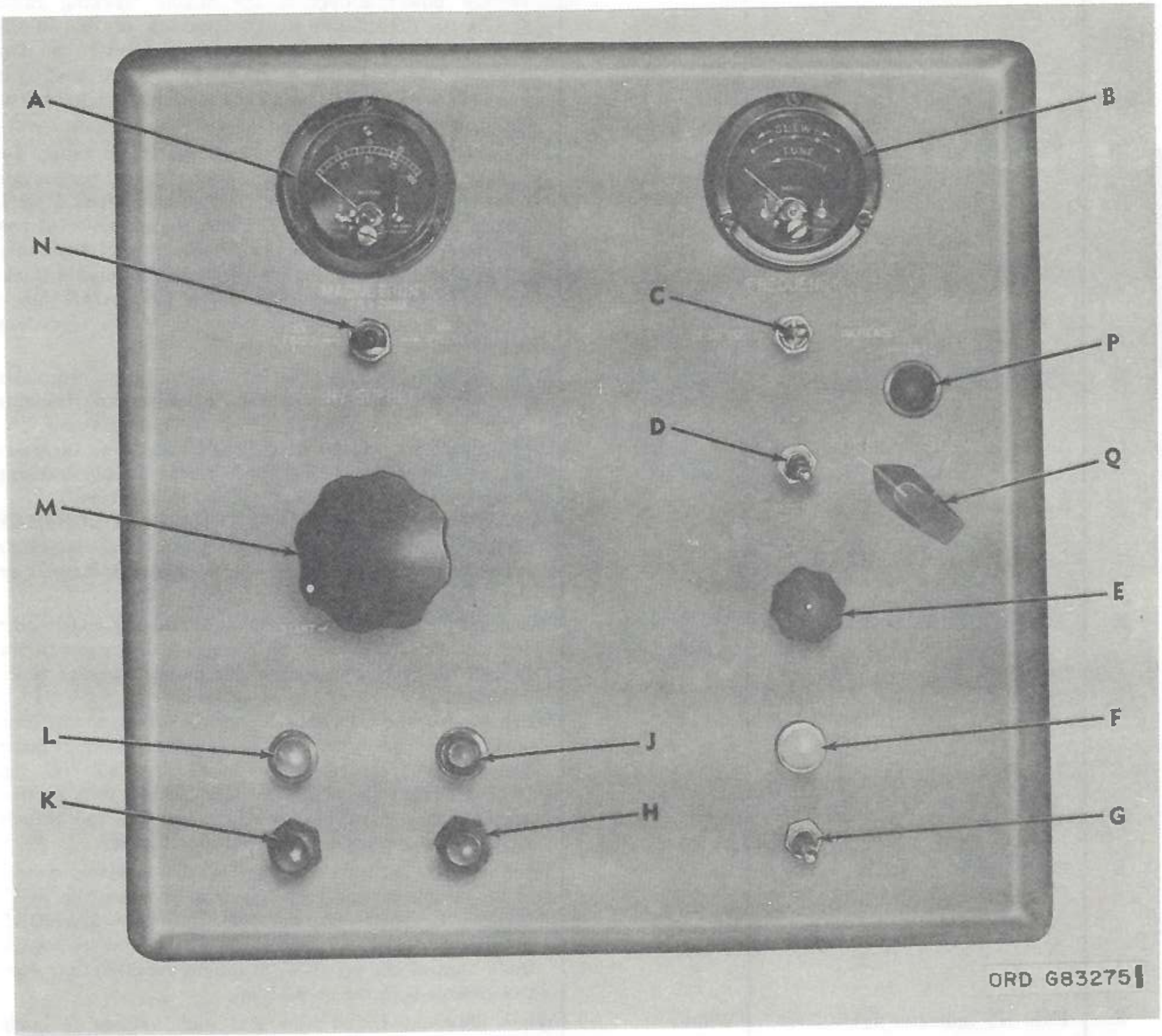


Figure 105 (U). Missile track control power supply—controls and indicators.

Key to fig. 105	Control or indicator	Type	Function
A	MAGNETRON meter		Indicates magnitude of average magnetron current of the missile tracking radar system, magnitude of high voltage applied to transmitter system of the missile tracking radar system, or magnitude of current of high voltage power supply of the missile tracking radar system as determined by the position of the MAGNETRON switch (N fig. 105). The meter has two scales. The top scale is graduated from 0 to 20, in increments of 1; the lower scale is graduated from 0 to 100 in increments of 5.
B	FREQUENCY meter		Indicates, on upper (SLEW) scale, the tuned cavity for which the missile tracking radar system magnetron is tuned. The upper scale is graduated from 5 to 1. Indicates, on lower (TUNE) scale, the existence of any difference between the resonant frequency of the tuned cavity and the operating frequency of the missile tracking radar system magnetron. The lower scale has a darkened segment which is used for an on frequency indication.
C	FREQUENCY switch	Toggle (three-position, spring-loaded to center position).	When operated to the DECREASE position, decreases the frequency of the magnetron of the missile tracking radar system to a minimum of 8500 megacycles. When operated to the INCREASE position, increases the frequency of the magnetron of the missile tracking radar system to a maximum of 9600 megacycles. When released from either the INCREASE or DECREASE position, causes the magnetron of the missile tracking radar system to operate at the frequency indicated on the FREQUENCY meter (B, fig. 105).
D	AGC-MANUAL switch	Toggle (two-position).	When set to the AGC position, causes the automatic gain control (AGC) circuits to automatically control the gain of the receiver system of the missile tracking radar system. When set to the MANUAL position, permits the gain of the receiver system of the missile tracking radar system to be controlled by the GAIN knob (E, fig. 105), provided the TEST switch (A, fig. 104) on the missile track control drawer (fig. 36) on the missile radar control console is in the up position.
E	GAIN knob	Rotary	When turned, adjusts the gain of the receiver system of the missile tracking radar system, provided the AGC-MANUAL switch (D, fig. 105) is in the MANUAL position, and the TEST switch (A, fig. 104) on the missile track control drawer (fig. 36) on the missile radar control console is in the up position.
F	IND HV indicator light	White	When illuminated, indicates that high voltage is being applied to the range indicator (fig. 36) of the missile radar control console.
G	IND HV switch	Toggle (two-position).	When turned to the on (up) position, applies high voltage to the range indicator (fig. 36) on the missile radar control console, and illuminates IND HV indicator light (F, fig. 105).

Figure 105 (U). Missile track control power supply—controls and indicators—legend.

Key	Control or indicator	Type	Function
H	HV SUPPLY-ON switch	Pushbutton	When depressed, applies high voltage to the transmitter system of the missile tracking radar system. Illuminates HV SUPPLY-ON indicator light (J, fig. 105), and the MISSILE-HIGH VOLTS-ON indicator light (G, fig. 88) on the radar power control panel (fig. 33) and inhibits the AFC disabling circuit which is controlled at the T1 trainer. Extinguishes the HV SUPPLY-READY indicator light (L. fig. 105), and extinguishes the following indicator lights on the radar power control panel: *a.* MISSILE-HIGH VOLTS-READY indicator light (H, fig. 88). *b.* MISSILE-HIGH VOLTS-HOT indicator light (J, fig. 88). *c.* MISSILE-HIGH VOLTS-PREHEAT indicator light (K, fig. 88). *d.* MISSILE-INTLK indicator light (P, fig. 88).
J	HV SUPPLY-ON indicator light	Red	When illuminated, indicates that high voltage is being applied to the transmitter system of the missile tracking radar system.
K	HV SUPPLY-OFF switch	Pushbutton	When depressed, removes high voltage from the transmitter system of the missile tracking radar system. Extinguishes HV SUPPLY-ON indicator light (J, fig. 105), and the MISSILE-HIGH VOLTS-ON indicator light (G, fig. 88) on the radar power control panel (fig. 18). Illuminates the HV SUPPLY-READY indicator light (L, fig. 105) and illuminates the following indicator lights on the radar power control panel: *a.* MISSILE-HIGH VOLTS-READY indicator light (H, fig. 88). *b.* MISSILE-HIGH VOLTS-HOT indicator light (J, fig. 88). *c.* MISSILE-HIGH VOLTS-PREHEAT indicator light (K, fig. 88). *d.* MISSILE-INTLK indicator light (P, fig. 88).
L	HV SUPPLY-READY indicator light.	Green	When illuminated, indicates that high voltage may be applied to the transmitter system of the missile tracking radar system.
M	HV SUPPLY knob	Rotary	When turned, adjusts high voltage applied to the transmitter system of the missile tracking radar system, as indicated on the MAGNETRON meter (A, fig. 105). (Must be in START position, fully counterclockwise, before high voltage can be applied to the transmitter system.)
N	MAGNETRON switch	Lever (three-position, spring-loaded to center position).	When operated to the KV FS=20 position, causes the MAGNETRON meter (A, fig. 105) to indicate the magnitude of high voltage being applied to the magnetron of the transmitter system of the missile tracking radar system. The magnitude is indicated on the upper scale of the meter. The scale is graduated from 0 to 20, representing 0 to 20,000 volts in increments of 1, representing 1000 volts.

*Figure 105 (U). Missile track control power supply—controls and indicators—legend—*continued (U).

Key	Control or indicator	Type	Function
			When set to the FS 20MA position, causes the MAGNETRON meter (A, fig. 105) to indicate the average current of the magnetron of the transmitter system of the missile tracking radar system. Current is indicated in milliamperes on the top scale of the meter. Scale is graduated from 0 to 20 milliamperes in increments of 1 milliampere. When operated to MA FS=100 position, causes the MAGNETRON meter (A, fig. 105) to indicate average current of the magnetron high voltage power supply of the missile tracking radar system. Current is indicated in milliamperes on the lower scale of the meter. Scale is graduated from 0 to 100 milliamperes in increments of 5 milliamperes.
P	OFF FREQ indicator light	Light red	When illuminated, indicates that the missile tracking radar system magnetron is operating at an incorrect frequency.
Q	TUNE-SLEW switch	Rotary (two) position).	When set to the TUNE position, causes FREQUENCY meter (B, fig. 105) to indicate on the TUNE scale and allows FREQUENCY switch (C, fig. 105), when operated, to change the frequency of the missile tracking radar system magnetron at a tune (slow) rate. When set to the SLEW position, causes FREQUENCY meter (B, fig. 105) to indicate on the SLEW scale and allows FREQUENCY switch (C, fig. 105), when operated, to change the frequency of the missile tracking radar system magnetron at a slew (fast) rate.

Figure 105 (U). Missile track control power supply—controls and indicators—legend—continued (U).

rate at which the azimuth position continues to increase or decrease remains the same as that of the azimuth handwheel at the time manual rotation was discontinued. The direction and rate continues until the azimuth handwheel is rotated in the opposite direction, or until the azimuth MAN-AID-AUTO switch is set to the MAN or AUTO position.

(3) *Automatic mode.* To operate in this mode the missile-tracking radar system must be in the test condition, and the azimuth MAN-AID-AUTO switch (L, fig. 104) must be set to the AUTO position. With the system in the above condition, the missile-tracking radar system locks on and automatically tracks the missile in azimuth, provided the conditions given in (*a*) and (*b*) below are fulfilled.

(*a*) The missile is presently being tracked in range and elevation in either the manual, aided, or automatic mode.

(*b*) The missile is presently being tracked in azimuth in either the manual or aided mode.

d. Missile Elevation Control. All controls necessary for the operation of the elevation positioning system of the missile-tracking radar system are on the missile track control drawer (fig. 36). The elevation angle to which the track antenna reflector assembly (fig. 50) of the missile track antenna-receiver-transmitter group is pointing is indicated by the ELEVATION dial (S, fig. 103) on the missile track indicator (fig. 36). The elevation positioning system has three modes of operation: manual, aided, and automatic. These three modes of operation are used only when the missile-tracking radar system is in the test condition; automatic operation is always used when the missile-tracking radar system is in normal operation.

(1) *Manual mode.*

(*a*) To operate in this mode the missile-tracking radar system must be in the test condition, and the elevation MAN-AID-AUTO switch (Q, fig. 104) on the missile track control drawer (fig. 36) must be set to the MAN position. The elevation handwheel (N, fig. 104) is then rotated either clockwise or counterclockwise to position the track antenna reflector assembly (fig. 50) associated with the missile-tracking radar system to the desired elevation angle.

(*b*) If the missile-tracking radar system is in the test condition, and the LAUNCHER ACQUIRE switch (C, fig. 104) is operated, the track antenna reflector assembly automatically slews to the elevation angle of the designated missile, or to the guided missile flight simulator if a missile has not been designated.

(2) *Aided mode.* To operate in this mode the missile-tracking radar system must be in the test condition and the elevation MAN-AID-AUTO switch (Q, fig. 104) must be in the AID position. When the elevation MAN-AID-AUTO switch is in the AID position and the elevation handwheel is rotated and then released, the elevation angle of the missile as represented by the elevation positioning system of the missile-tracking radar system automatically continues to increase or decrease. The direction and rate at which the elevation angle continues to increase or decrease remains the same as that of the elevation handwheel at the time manual rotation was discontinued. This direction and rate continues until the elevation MAN-AID-AUTO switch is set to the MAN or AUTO position or until the elevation

handwheel is rotated in the opposite direction.

Caution: **Do not allow the antenna to drive into the antenna elevation stops.**

(3) *Automatic mode.* To operate in this mode the missile tracking radar system must be in the test condition, and the elevation MAN-AID-AUTO switch (Q, fig. 104) must be set to the AUTO position. With the system in the above condition the missile tracking radar system locks on and automatically tracks the missile in elevation provided the conditions in (*a*) and (*b*) below are fulfilled.

(*a*) The missile is presently being tracked in range and azimuth in either the manual, aided, or automatic mode.

(*b*) The missile is presently being tracked in elevation in either the manual or aided mode.

e. Missile Selection Control.

(1) *Automatic missile selection.* During normal operation the type missile information corresponding to the setting of the MISSILE switch (GG, 1, fig. 77) and MISSION switch (LL, 1, fig. 77) on the battery signal panel-indicator (fig. 24) on the battery-control console is transmitted to the launching area. The launching area personnel then designate the missile to be fired. Operation of equipment in the launching area is presented in TM 9-5096-1.

(2) *Local missile selection.*

(*a*) During test conditions or emergency conditions the missile tracking radar system operates in the local mode. Operation under emergency conditions is discussed in paragraphs 120 and 121. To operate in the local mode, the LOCAL DESIGNATE switch (J, fig. 103) on the missile track indicator (fig. 36) must be set to the on (up) position. When the switch is in this position, a launching section can be designated by operating any one of four SECTION switches (U, V, W, or X; fig. 103). The designated section is indicated by illumination of the corresponding SECTION indicator light (Y, Z, AA, or BB; fig. 103). After a section has been designated, a launcher can be designated by operating any one of four LAUNCHER switches (N, P, Q, or R; fig. 103). The launcher designated is indicated by illumination of the corresponding LAUNCHER indicator light (B, C, D, or E; fig. 103).

(*b*) When the missile-tracking radar system is conditioned for local operation and the TEST RESPONDER switch (K, fig. 103) is depressed, the TEST RESPONDER indicator light (G, fig. 103) illuminates. This indicates that the guided missile flight simulator is designated instead of a missile.

(*c*) If the missile tracking radar system is conditioned for local operation and the computer is conditioned for either action or tracking test (par. 91*b*(1)(*a*), and 91*b*(1)(*c*)) the missile tracking radar system slews to the azimuth, elevation and range of either the designated missile or the guided missile flight simulator, whichever is designated, when the LAUNCHER ACQUIRE switch (C, fig. 104) on the missile track control drawer (fig. 36) is operated.

f. Magnetron Frequency Control. Frequency control of the missile tracking radar magnetron is effected by the FREQUENCY switch (C, fig. 105), TUNE-SLEW switch (Q, fig. 105), FREQUENCY meter (B, fig. 105), and the OFF FREQ light (P, fig. 105) on the missile track control power supply (fig. 36). When the TUNE-SLEW switch is set to the SLEW position, the FREQUENCY meter indicates on the SLEW scale and the FREQUENCY switch can be operated to increase or decrease magnetron frequency at a slew (fast) rate. The SLEW scale of the FREQUENCY meter is marked with positions 5 through 1 which represent tuned cavities that may be used in the missile tracking radar system. The magnetron frequency is changed at a slew (fast) rate until the FREQUENCY meter indicates the preselected tuned cavity that is in use. When the TUNE-SLEW switch is set to the TUNE position, the FREQUENCY meter indicates on the TUNE scale and the FREQUENCY switch can be operated to increase or decrease magnetron frequency at a tune (slow) rate. The TUNE scale of the FREQUENCY meter has a darkened segment which represents the resonant frequency of the preselected tuned cavity. When the magnetron operating frequency is not the same as the tuned cavity resonant frequency, the FREQUENCY meter indicates to the right of the darkened segment. When the magnetron operating frequency is the same as the tuned cavity resonant frequency, the FREQUENCY meter indicates in the darkened segment. The OFF FREQ light illuminates when the magnetron operating frequency is not the same as the tuned cavity resonant frequency.

g. Missile High Voltage Control. Missile high voltage control consists of the observations that must be made and the operations that must be performed by the operator to apply high voltage to and remove high voltage from the range indicator (fig. 36) on the missile radar control console, and the magnetron of the transmitter system of the missile tracking radar system. The controls and indicator lights used to perform these operations are discussed in (1) and (2) below.

(1) *Indicator high voltage control.* When the IND HV switch (G, fig. 105) on the missile track control power supply (fig. 36) is turned to the on (up) position, high voltage is applied to the range indicator of the missile radar control console. This causes the cathode-ray tube of the range indicator to illuminate, provided the INTENSITY knob (B, fig. 107) on the range indicator is properly adjusted. This also causes the IND HV indicator light (F, fig. 105) on the missile track control power supply (fig. 36) to illuminate.

(2) *Magnetron high voltage control.*

Caution: **Safety devices are built into the magnetron high voltage circuitry to insure proper energization, but these safety devices may fail; therefore, it is necessary that the missile tracking radar system equipment be energized in the manner prescribed in tables XV, and XVI, in sequence, to prevent damage to or possible failure of the equipment.**

(*a*) When illuminated, the HV SUPPLY-READY indicator light (L, fig. 105) on the missile track control power supply indicates that the necessary time delay has elapsed, and high voltage may be applied to the magnetron of the missile tracking radar system, provided the HV SUPPLY knob (M, fig. 105) is in the START position.

(*b*) When the HV SUPPLY-ON switch (H, fig. 105) is depressed, the magnetron is energized, the HV SUPPLY-ON indicator light (J, fig. 105) illuminates, and the HV SUPPLY-READY indicator light (L, fig. 105) extinguishes, provided the HV SUPPLY knob is in the START position. After the magnetron is energized, the current of the magnetron is controlled by the HV SUPPLY knob. Turn knob smoothly clockwise from the START position until MAGNETRON meter (A, fig. 105) indicates 8.5 ma for NIKE-HERCULES operation, or 15 ma for NIKE-AJAX operation.

Caution: **Do not force knob beyond mechanical stops. If meter pointer fluctuation is sufficient to actuate the overcurrent sensing device causing the HV SUPPLY-ON indicator light (J, fig. 105) to extinguish, turn knob all the way counterclockwise and notify an organizational maintenance technician.**

Note. To read the average magnetron current, MAGNETRON switch (N, fig. 105) must be in the center position (FS 20MA).

(*c*) The HV SUPPLY knob (M, fig. 105) is rotated counterclockwise to the START position and the HV SUPPLY-OFF switch (K, fig. 105) is depressed to deenergize the magnetron. The HV SUPPLY-READY indicator light (L, fig. 99) illuminates, and the HV SUPPLY-ON indicator light (J, fig. 99) extinguishes.

90 (CMHA). Description of Missile Tracking Radar Presentation

The missile tracking radar presentation indicates missile range, azimuth, and elevation information. The range information is presented by means of a range indicator. The azimuth information is presented by means of an azimuth dial and an azimuth error meter. The elevation information is presented by means of an elevation dial and an elevation error meter.

Note. The term "missile" when used in this paragraph in connection with presentation obtained during testing operations is synonymous with the terms object or target for reasons explained in paragraph 89*a*(2).

a. Range Indicator Presentation. The range indicator presentation is presented by means of a cathode-ray tube and a range dial. One of two types of presentations is presented on the cathode-ray tube. The type is determined by the setting of the IMAGE SPACING switch (E, fig. 107) on the range indicator (fig. 36) on the missile radar control console. The cathode-ray tube presented as selected by the IMAGE SPACING switch is adjusted or varied by three controls on the front of the range indicator.

(1) *Presentation with the IMAGE SPACING switch set to the OFF or NOR position.* The range indicator presentation is identical when the IMAGE SPACING switch (E, fig. 107) is set to either the OFF or NOR position. This presentation is shown on figure 123. The presentation consists of a coder pulse and a transmitted pulse, 500-yard expanded sweep, and the 100-yard range notch, all super-imposed on the baseline. The target "pip" becomes part of the presentation when a radar return signal or a missile transmitted signal is being received by the missile tracking radar system. The range indicator is normally operated with the IMAGE SPACING switch set to the OFF or NOR position.

(*a*) *Baseline.* The baseline (fig. 123) extends across the face of the cathode-ray tube and represents a maximum range of either 200,000 yards or 55,000 yards, depending upon the type missile to be used. The baseline can be adjusted to represent any range between 40,000 and 200,000 yards when the missile tracking radar system is conditioned for a NIKE-HERCULES engagement, or the baseline can be adjusted to represent any range between 10,000 and 55,000 yards when the missile tracking radar system is conditioned for a NIKE-AJAX engagement. The left end of the baseline represents 0 yards in range and the right end represents the maximum adjusted range. Superimposed on the baseline is "grass" (noise) that reduces to a minimum when the missile tracking radar system is locked on the missile.

(*b*) *Transmitted pulse and coder pulse.* When the missile tracking radar system is conditioned for a NIKE-AJAX engagement, the coder pulse (fig. 123) appears as a clearly defined pulse on the left end of the baseline, and the transmitted pulse (fig. 123) appears directly to the right of the coder pulse. When the missile tracking radar system is conditioned for a NIKE-HERCULES engagement, the coder pulse and the transmitted pulse appear defocused and intermixed on the left end of the baseline. The coder pulse indicates that the coder system of the missile tracking radar system is operating. The transmitted pulse represents 0 yards in range and signifies that the missile tracking radar system is transmitting. Neither pulse has any operational significance, but appears only because of inherent characteristics of the missile tracking radar system.

(*c*) *500-yard expanded sweep.* The 500-yard expanded sweep (fig. 123) enlarges a segment of the baseline for better definition of a target "pip". The 500-yard expanded sweep moves left

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to the launching area the information corresponding to the setting of the MISSION switch and the MISSILE switch.

g. Operating the Missile Tracking Radar System. During an engagement the operation of the missile tracking radar system is automatic.

(1) The TEST NORMAL switch (A, fig. 104) on the missile track control drawer is set to NORMAL. This action removes the effect of test circuitry and conditions the missile tracking radar system for automatic operation.

(1.1) With the TUNE-SLEW switch (Q, fig. 105) set to the SLEW position, the FREQUENCY meter (B, fig. 105) indicates the correct preselected tuned cavity number on the SLEW scale. With the TUNE-SLEW switch set to the TUNE position, the FREQUENCY meter indicates in the darkened segment of the TUNE scale. The OFF FREQ indicator light (P, fig. 105) does not illuminate.

(2) The RECEIVED SIGNAL meter (K, fig. 106) on the missile control-indicator group (fig. 36) indicates the strength of the returned signal from the designated missile. This signal should be as great or greater than the value specified by organizational maintenance personnel. The range indicator (fig. 36) is observed to ascertain that a "pip" is centered in the 100-yard range notch (fig. 121). The "pip" indicates that the missile tracking radar system is "locked-on" and tracking the designated missile. The operator should monitor the RECEIVED SIGNAL meter and the range indicator (fig. 36) to obtain information concerning the behavior of the designated missile throughout the engagement.

(3) The TRACK indicator light (E, fig. 106) illuminates if the missile tracking radar locks on the designated missile and the missile tracking radar magnetron operating frequency is correct. Failure of the indicator light to illuminate can be overridden by depressing the TRACK switch (H, fig. 104). This action provides the necessary indicator light and relay sequence for firing the missile. Should the missile be considered unfit to fire, a new missile must be designated and the REJECT switch (K, fig. 104) depressed. If the beacon of an airborne missile is "lost" and is not acquired by the missile tracking radar within three seconds, the missile tracking radar slews to the next designated missile or to the flight simulator if no missile has been designated.

h. Firing the Missile. When the green READY TO FIRE indicator light (T, 1, fig. 77) on the battery signal panel-indicator (fig. 24) is illuminated, the system is ready to fire. The altitude and horizontal plotting boards display information that aids in determining when the FIRE switch (V, 1, fig. 78) on the tactical control-indicator (fig. 24) should be operated. After the FIRE switch is operated, the remainder of the engagement is automatic.

113 (U). Surface-to-Air Low Altitude Mission

When the MISSION switch (LL, 1, fig. 77) on the battery signal panel-indicator (fig. 24) is set to the LA position, the equipment in the radar course directing central is automatically conditioned for a surface-to-air low altitude engagement. The operational sequence is the same as that for a normal surface-to-air engagement, discussed in paragraph 112.

114 (CMHA). Surface-to-Surface Mission

Provisions for the surface-to-surface engagement were incorporated into the NIKE-HERCULES System to supplement its primary objective, which is to engage and destroy hostile aircraft approaching a defended area.

a. During a surface-to-surface engagement, the operation of the radar course directing central is the same as the operation during the surface-to-air engagement, with the exceptions given in (1) through (5) below.

(1) *Preliminary data.* The information designating the NIKE-HERCULES System for a surface-to-surface engagement comes from higher headquarters. This information consists of the following: mission and warhead; azimuth, elevation, and range setting of the target tracking radar system; and height displacement and FINAL DIVE TIME setting of the computer. Upon receipt of this information, the MISSION switch (LL, 1, fig. 77) on the battery signal panel-indicator (fig. 24) is set to SS and the MISSILE switch (GG, 1, fig. 77) on the battery signal panel-indicator is set to select the warhead ordered for the engagement. After both switches are set, the LAUNCHER DATA switch (JJ, 1, fig. 77) on the battery signal panel-indicator is depressed.

(2) *Acquisition radar system.* Because the target position coordinates are known, the acquisition radar system is not used; however, the IFF-FOE switch (U, fig. 82) on the acquisition control-indicator, and the DESIGNATE-ABANDON switch (B, fig. 79) on the target designate control-indicator are used. The IFF-FOE switch must be depressed, and the DESIGNATE-ABANDON switch must be operated to DESIGNATE before the target-tracked signal can be initiated. Target foe, target designated, and target tracked signals must be initiated during a surface-to-surface engagement. The NIKE-HERCULES System requires that these procedures be performed before a missile can be fired.

(3) *Missile tracking radar system.* The operation of the missile tracking radar system during a surface-to-surface engagement is the same as during a surface-to-air engagement, discussed in paragraph 112*g*, with the exceptions explained in (*a*) and (*b*) below.

(*a*) In a surface-to-surface engagement, a line of sight between the missile track antenna-receiver-transmitter group and the target may not be obtainable due to masking. Therefore the missile tracking radar system could lose control of the missile before it reaches the target. To prevent this loss of control and the resultant detonation of the missile warhead due to the missile fail-safe feature, a guidance cutoff point is manually set into the missile tracking radar system. The elevation of this point is some distance above the point where ground guidance would normally be lost. When the missile reaches this guidance cutoff point, the missile tracking radar system transmits a signal which disables the fail-safe mechanism. This causes the missile to roll 180 degrees, arming a barometric fuse. The missile then follows a substantially vertical ballistic trajectory toward the target until the altitude is reached at which the barometric fuse causes the missile warhead to detonate.

(*b*) The guidance cutoff (GCO) point is preset into the missile tracking radar system. For adjustment of GCO refer to TM 9-1430-251-20.

(4) *Target tracking radar system.* During a surface-to-surface engagement the target tracking radar system is operated in the manual mode, discussed in paragraph 87. The azimuth, elevation, and range coordinates of the target are obtained from the battery control officer. The elevation and azimuth coordinates are set into the target tracking radar system by means of the local antenna control at the target track antenna-receiver-transmitter group (fig. 49). The elevation and azimuth settings are locked in by setting the ELEV switch (E, fig. 97) and AZ switch (F, fig. 97) on the electric light control (fig. 34) to the COORDINATE LOCK position. The range coordinate is set into the target tracking radar system by means of the range handwheel (P, fig. 96) and the range SLEW switch (K, fig. 96) on the target track control drawer (fig. 34). The range setting is locked in by setting the RANGE switch (G, fig. 97) on the electric light control to the COORDINATE LOCK position. When all three coordinates of the target are set and locked in the target tracking radar system, the TRACKED switch (G, fig. 96) on the target track control drawer is depressed. The ACQUIRE switch (E, fig. 96) on the target track control drawer is not operated as in a surface-to-air engagement since target confirmed is automatic during a surface-to-surface engagement. The target tracking radar system continues to operate in the manual mode, and remains set to the manually set-in coordinates throughout the engagement.

(5) *Computer system.* When the MISSION switch (LL, 1, fig. 77) on the battery signal panel-indicator (fig. 24) is set to the SS position, the computer system is automatically conditioned for a surface-to-surface engagement. However, the correct value of height displacement and final dive time must be manually set into the computer system. Height displacement is the distance above the target of the displaced aiming point. The correct value of height displacement is obtained from the recorder sheet and is set into the computer system by adjusting the HT DISPLACE knob (G, fig. 86) in the upper compartment of the servo computer assembly (fig. 28). Final dive time is the time before the missile reaches the displaced aiming point that the final dive orders are issued. The correct value of final dive time is also obtained from the recorder sheet and is set into the computer system by adjusting the FINAL DIVE TIME knob (E, fig. 86) in the upper compartment of the servo computer assembly (fig. 28) and is indicated on the FINAL DIVE TIME dial (f, fig. 86).

b. After the operations discussed in *a* above have been performed, and the READY TO FIRE indicator light (T, 1, fig. 77) on the battery signal panel-indicator (fig. 24) illuminates, the system is ready to fire. After the FIRE switch (V, 1, fig. 78) on the tactical control-indicator (fig. 24) is operated, the remainder of the engagement is automatic.

114.1 (U). Firing Data

Firing data to be used in a surface-to-surface mission are presented in Department of the Army Firing Table HERCULES A-1 and within this technical manual.

114.2 (U). Computer Input Data Nomogram

a. The results of NIKE-HERCULES simulated surface-to-surface trajectories were used to derive gravity corrections, height displacements (H_D), maximum guidance cutoff angles (MAX $\emptyset_L$), and final dive times (FDT) (fig. 131.1).

b. Data presented in the nomogram was derived assuming the parallax between the launcher and the radars to be zero. Also, the launcher, radars, and target were considered as being at sea level.

c. Gravity corrections under 10 yards may be neglected; therefore, the R_L scale on the right

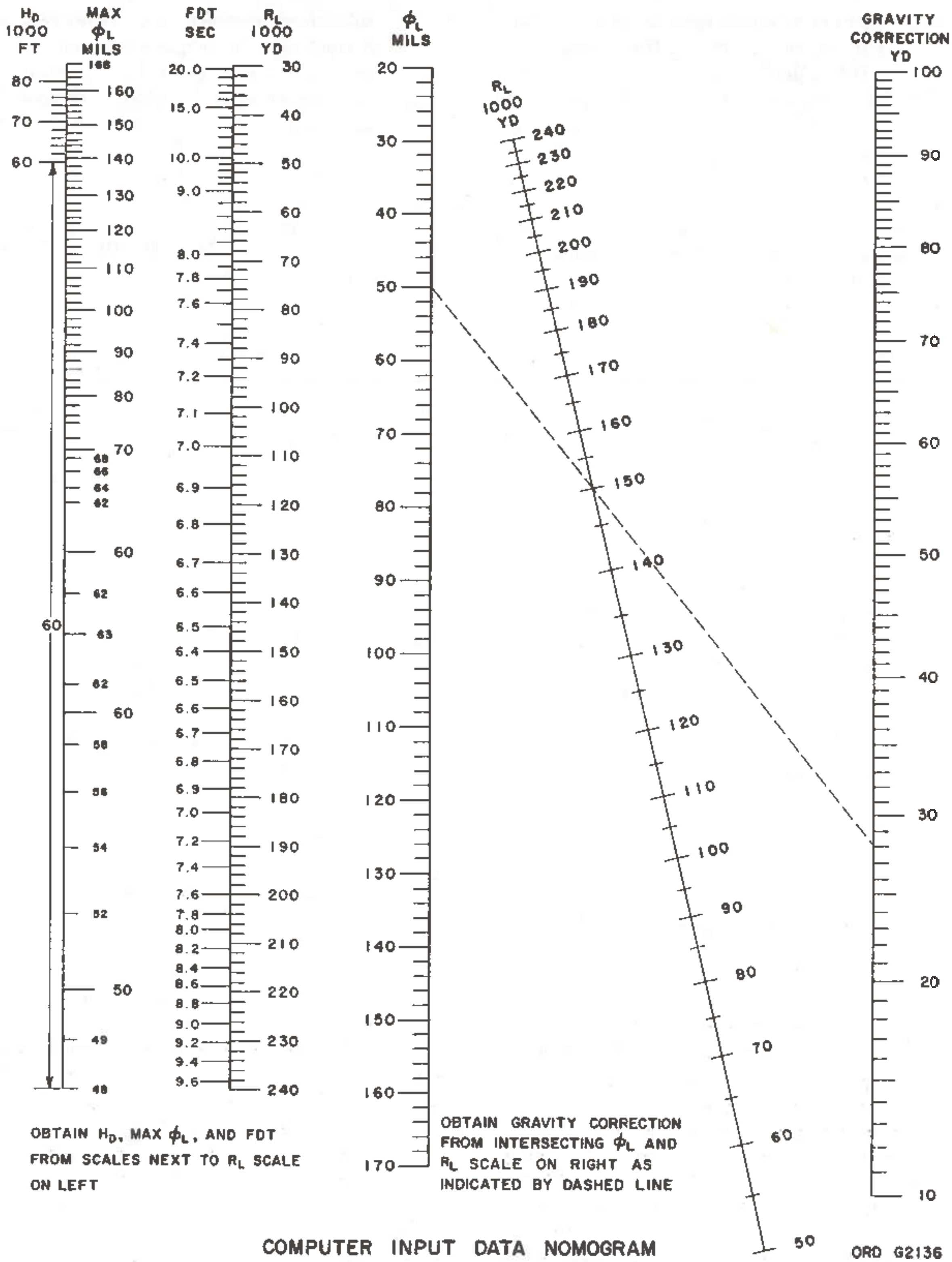


Figure 131.1 (UNCLASSIFIED). Computer input data nomogram (U).

reflects only ranges where gravity correction values may be significant. Nomogram scales do not reveal system limitations.

d. Gravity correction may be read by laying a straightedge from the $Ø_L$ scale to the R_L scale on the right through to the gravity correction scale, as indicated by the dashed line.

e. Height displacement (H_D), maximum guidance cutoff angle (MAX $Ø_L$), and final dive (FDT) corresponding to specific R_L values are read from scales adjacent and corresponding to the R_L scale on the left.

114.3 (U). Altitude Correction Nomogram

a. Altitude correction nomogram (fig. 131.2) prescribes the correction to the surface-to-surface firing range based on true ground distance (R_S) and average target tracking radar/target altitude. See TM 5-241 for detailed discussion and need for this correction.

b. The altitude correction nomogram may be read by laying a straightedge from the R_S scale to the average TTR/target altitude scale through to the altitude correction scale.

Note. No correction is required for values of average TTR/target altitude or values of R_S less than those reflected in the nomogram.

114.4 (CMHA). Minimum Guidance Cutoff Set

a. Minimum guidance cutoff set, table XVI.1, prescribes the minimum allowable GCO settings that may be set in at the missile tracking radar. This is required to allow final arming of the warhead from guidance cutoff to burst.

b. Minimum guidance cutoff set for all ranges greater than 100,000 yards is 20 angular mils.

Table XVI.1 (CONFIDENTIAL Modified Handling Authorized). Minimum Guidance Cutoff Set (U) [1]

True ground distance TTR-to-target (R_s) (yards)	Minimum guidance cutoff set (GCO SET) (mils)	True ground distance TTR-to-target (R_s) (yards)	Minimum guidance cutoff set (GCO SET) (mils)
33,000	59	39,000	48
34,000	57	40,000	47
35,000	55	41,000	46
36,000	53	42,000	45
37,000	51	43,000	44
38,000	50	44,000	43

See footnote at end of table.

Table XVI.1 (CONFIDENTIAL Modified Handling Authorized). Minimum Guidance Cutoff Set (U) [1]—Continued

True ground distance TTR-to-target (R_s) (yards)	Minimum guidance cutoff set (GCO SET) (mils)	True ground distance TTR-to-target (R_s) (yards)	Minimum guidance cutoff set (GCO SET) (mils)
45,000	42	73,000	27
46,000	41	74,000	27
47,000	40	75,000	26
48,000	39	76,000	26
49,000	38	77,000	26
50,000	38	78,000	25
51,000	37	79,000	25
52,000	36	80,000	25
53,000	36	81,000	25
54,000	35	82,000	24
55,000	34	83,000	24
56,000	34	84,000	24
57,000	33	85,000	24
58,000	33	86,000	23
59,000	32	87,000	23
60,000	32	88,000	23
61,000	31	89,000	23
62,000	31	90,000	22
63,000	30	91,000	22
64,000	30	92,000	22
65,000	30	93,000	22
66,000	29	94,000	21
67,000	29	95,000	21
68,000	29	96,000	21
69,000	28	97,000	21
70,000	28	98,000	21
71,000	28	99,000	21
72,000	27	100,000	20

[1] Minimum GCO SET for all ranges greater than 100,000 yards is 20 mils.

114.5 (CMHA). Altitude of Burst Correction

A dynamic pressure lag in the barometric fuse line requires that a correction be made to the equivalent altitude of burst. The value of this correction is minus 373 feet.

114.6 (CMHA). Symbology and Data Utilization

a. H_D (height displacement) is utilized as prescribed in paragraph 114*a*(5).

b. At least 10 seconds of final guidance must be obtained before the guidance cutoff point is reached. Therefore a maximum guidance cutoff angle that may be set in at the missile tracking radar is prescribed. MAX $Ø_L$ is the symbol for

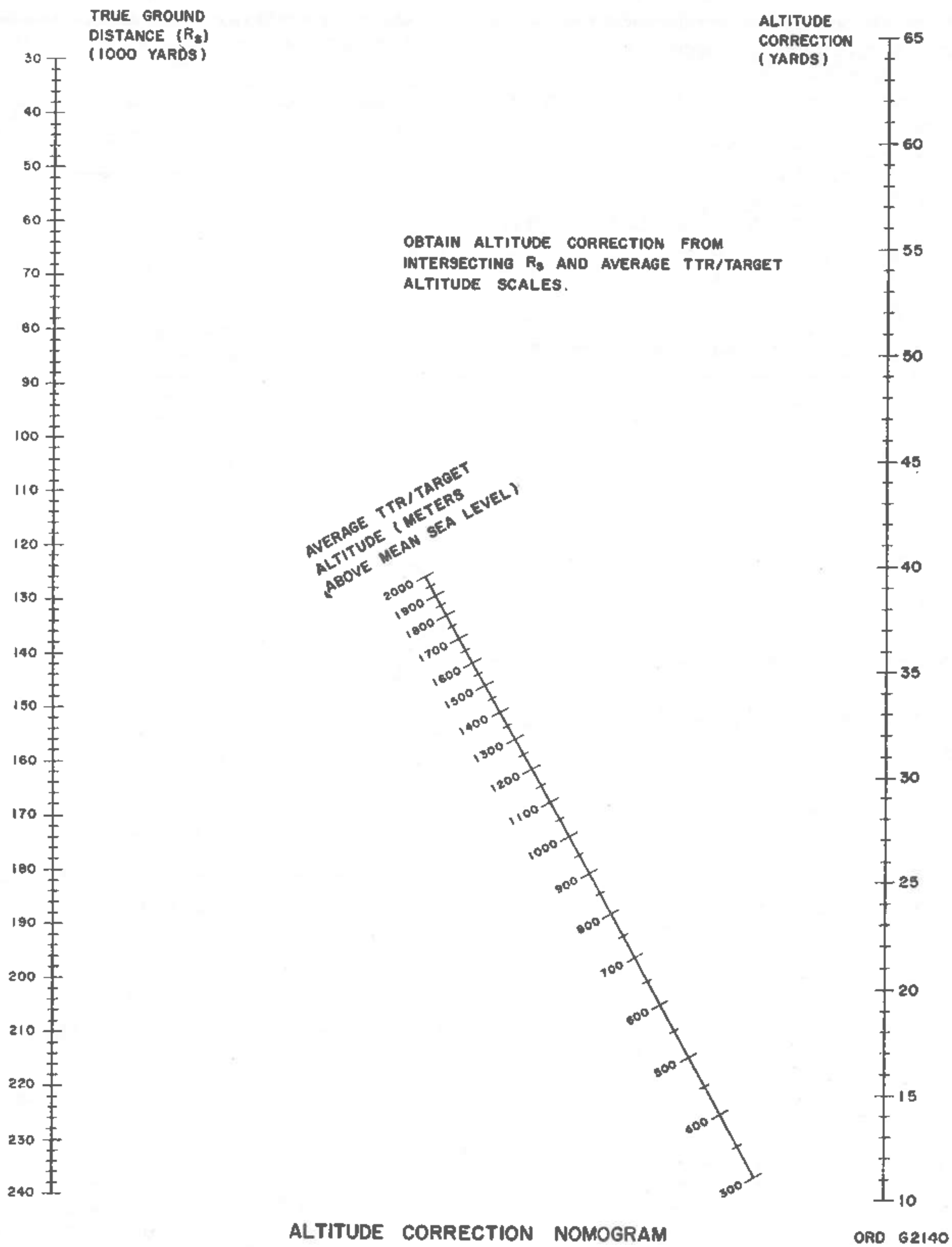


Figure 131.2 (UNCLASSIFIED). Altitude correction nomogram (U).

this quantity. This is utilized as prescribed in FM 44-95.

c. FDT (final dive time) is utilized as prescribed in paragraph 114*a*(5).

d. R_L (launcher-to-target radar plane range) is used as an argument in computer input data nomogram (fig. 131.1). It is calculated and further utilized as prescribed in FM 44-95.

e. $\emptyset_L$ (launcher cutoff angle) equals guidance cutoff angle (GCO) in the simulations per assumptions outlined in paragraph 114.2. For field use, however, launcher cutoff angle is defined by the formula

$$\emptyset_L = (GCO - Si)\frac{R_s}{R_L}$$

where

GCO=radar mask + 5 angular mils

(angle of site) $Si = \frac{H_t - H_{tt}}{R_g/1000}$ angular mils

Launcher cutoff angle is calculated as prescribed in FM 44-95. It is used as an argument in computer input data nomogram (fig. 131.1).

f. The additional distance which must be considered in calculating the actual firing range to prevent the missile from impacting short of the target due to gravity effects is called gravity correction. This quantity is utilized as prescribed in FM 44-95.

g. R_s (true ground distance TTR-to-target) is used as an argument in altitude correction nomogram (fig. 131.2). It is calculated and further utilized as prescribed in FM 44-95.

h. The additional distance which must be considered in calculating the actual firing range due to the difference between map-derived range and the actual TTR-to-target range at different altitudes is called altitude correction. This quantity is utilized as prescribed in FM 44-95.

i. Minimum guidance cutoff set (para. 114.4) is utilized as prescribed in FM 44-95.

j. Actual firing range incorporating gravity and altitude corrections is calculated as prescribed in FM 44-95 and is utilized as prescribed in paragraph 114*a*(4).

k. Altitude of burst correction (para. 114.5) is added algebraically to the equivalent altitude of burst in feet for determination of BARO FUZE SET.

Section III (U). OPERATION OF THE RADAR COURSE DIRECTING CENTRAL UNDER UNUSUAL CLIMATIC CONDITIONS

Note. The operation of the radar and computing equipment may be difficult in regions where extreme cold, extreme heat, humidity and moisture, sand conditions, or high winds prevail. Procedures for minimizing the effects of these unusual climatic conditions are discussed in paragraphs 115 through 119.

115 (U). Operation in Extreme Cold

Subzero temperatures and climatic conditions associated with cold weather affect the operation of the equipment. Instructions and precautions for operations under such adverse conditions are given in *a* through *d* below.

a. Use the personnel heaters to keep the equipment as warm and dry as possible.

b. Keep the equipment energized to "Low Voltage" to maintain the minimum exhaust temperature in accordance with standing operation procedures (SOP's).

c. Cover all exterior openings which are not in use to help prevent excessive heat loss.

d. Place rubber-covered cables carefully and, if possible, do not bend or move them. If the cables must be bent or moved, warm them beforehand.

116 (U). Operation in Extreme Heat

When operating the equipment in continued high temperatures, it is essential that the ventilating systems function properly. Instructions for proper care are given in *a* and *b* below.

a. Personnel Ventilation. Inspect the blower in the personnel heater cabinet for proper operation. Check the air port and duct for free passage of air. Test the blower intake and discharge dampers for ease of operation.

b. Equipment Cooling. Check the operation of the equipment cooling fan in the equipment cooling cabinet (fig. 18). In systems 1383 and above, check the operation of the equipment cooling blowers B1 and B2 in the target radar control console (fig. 34) and equipment cooling blowers B3 and B4 in the radar set group (fig. 35). Make certain that the intake filter is clean. Test the operation of the shutter and damper control.

117 (U). Operation Under Extreme Dust Conditions

Operation of the equipment under extreme dust and sand conditions necessitates special care, since dust and sand form an abrasive mixture that causes rapid wear of equipment, often rendering it inoperative. Instructions and precautions for operation under such adverse conditions are listed in *a* through *c* below.

a. Inspect the ventilating filters frequently, and clean or replace, as necessary, to insure proper functioning of the ventilating systems.

b. Use protective covers whenever practical.

c. Pay particular attention to the lubrication of the equipment. Excessive amounts of dust or sand that some in contact with oil and grease result in grit which damages the equipment.

118 (U). Operation in Areas of High Humidity

Operation under conditions of high humidity presents problems of oxidation and corrosion, condensation, mildew, and fungus growth. During operation, sufficient heat is normally developed, and proper ventilation is maintained, to eliminate the problems associated with the high humidity. However, during nonoperational periods, high humidity may cause problems which render the equipment inoperative. These problems are reduced by following the procedures given in *a* through *c* below.

a. Operate the personnel heaters continuously and keep the trailer doors closed.

Caution: **Avoid overheating the equipment since excessive temperatures may damage it.**

b. Check that all cable fittings are tight to prevent moisture from entering the connectors. A cable end should never be left exposed without tightly securing its cap in place.

c. Periodically inspect the equipment for chipped or cracked paint and corrosion. Unpainted surfaces and worn spots should be

Section IV (U). SERVICE UPON RECEIPT

130.1 (U). General

When an RCDC is received by a using organization, it is the responsibility of the officer in charge to determine the operational condition of the equipment. Battery personnel are responsible for inspecting all assemblies, subassemblies, and associated components to make certain that the equipment is properly assembled, secured, and cleaned. Use care when examining the equipment to avoid the loss of small parts that could affect the operation of the system. Make an immediate record of any missing part and submit record through appropriate channels. Repair any damaged part as soon as possible.

130.2 (U). Points of Inspection

a. TM 9–1400–250–12 lists all points that must be inspected upon receipt of the RCDC.

b. After deficiencies are corrected, perform the checks and adjustments prescribed in TM 9–1430–251–20 before placing the system into tactical operation.

130.3 (U). Tags

Carefully read and follow instructions on all tags attached to the equipment. The information on these tags may be in the form of notes, cautions, or warnings. Remove any tag that might interfere with installation and operation. Record, for future reference, all information given on these tags.

130.4 (U). Modification Work Orders

Inspect the equipment to determine that all pertinent Department of the Army modification work orders (DA MWO's) have been applied and that no unauthorized modifications have been made. Refer to TM 9–1430–257–20, TM 9–1430–258–20, and TM 9–1430–259–20 for a current list of DA MWO's.

Section V (U). CLEANING

130.5 (U). General

Dirt and dust are a frequent cause of equipment malfunctions. Therefore, all components of the RCDC must be cleaned periodically.

a. Precautions. Certain precautions must be observed during cleaning. Failure to comply with the precautions listed below may result in harm to personnel and damage to equipment.

***Warning:* When using trichloroethane or mineral spirits, be sure that the area is well ventilated as the fumes are toxic, and mineral spirits are flammable.**

(1) The rapid evaporation of cleaning fluids when exposed to excessive heat has a drying effect on the skin. Wear rubber gloves to avoid possible cracking, irritation, or inflammation of the skin.

(2) Avoid direct contact between petroleum products and rubber parts, since petroleum products cause rubber to harden, crack, or dissolve. When contact is unavoidable, quickly wash affected parts with a solution of soap and water. Rinse and dry thoroughly.

(3) Use of gasoline or benzene as a cleaning agent is prohibited.

b. Cleaning Instructions. General cleaning instructions are prescribed below.

(1) Dust and sweep daily to remove dirt and loose items which might get into the equipment and cause a malfunction.

***Caution:* Use suction. Do not blow dust out of equipment.**

(2) Clean assemblies and components within cabinets and consoles monthly. If a vacuum cleaner is used near critical electronic equipment, use care to avoid damaging the equipment.

***Warning:* When using trichloroethane or mineral spirits, be sure that the area is well ventilated as the fumes are toxic, and mineral spirits are flammable.**

(3) Use trichoroethane 6810–664–0387 to clean or wash grease and oil from components.

(4) For general cleaning of painted surfaces and rubber parts, use clean water

or a solution of one cup of soap chips to one gallon of hot water. After parts are cleaned, rinse, and dry thoroughly.

(5) Use a clean, lint-free cloth moistened with antistatic and cleaning compound 6850-368-527 to clean all glass and plastic surfaces and to remove wax pencil markings from early warning plotting board.

(6) Clean lenses with lens paper 6640-162-2994.

(7) Cleaners, which are authorized for use, are listed in the TM's described in appendix II.

130.6 (U). Location and Maintenance of Air Conditioning Filters

Air conditioning filters provided in the RCDC are permanent-type filters. However, these filters become dirty and clogged and must be removed, cleaned, charged, and reinstalled. Typical maintenance procedures are described in *a* through *c* below.

a. Trailer Mounted Director or Tracking Stations.

Caution: **To prevent damage to equipment set MAIN POWER switch on acquisition power control panel to OFF before performing any maintenance on air conditioning filters.**

Note. Trailer mounted director and tracking stations that are emplaced against the interconnecting corridor do not use the air conditioning filters in the entrance doors.

(1) *Removal of the air conditioning filters.*

(*a*) If EQUIPMENT COOLING INTAKE door (2, fig. 146) is closed, release the captive fasteners (1) and open the door.

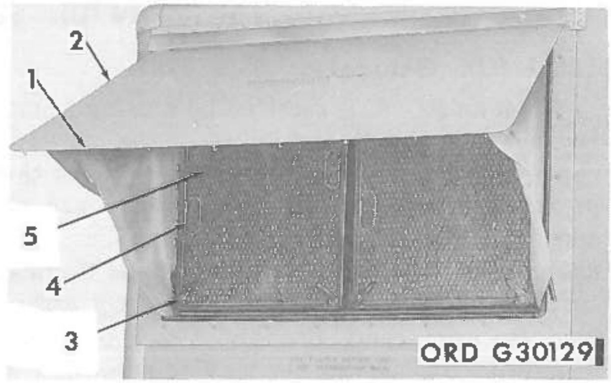
(*b*) Release the latches (3) securing each air conditioning filter (5).

(*c*) Grasp rings (4) and remove each filter.

(2) *Cleaning of the air conditioning filters.*

(*a*) Fill pan assembly 4925-217-2220 to a depth of approximately 2 inches with trichloroethane 6810-664-0387.

(*b*) Immerse the air conditioning filter with the coarse mesh side down in trichloroethane and agitate until the filter is clean.



1—Captive fastener (18)
2—EQUIPMENT COOLING INTAKE door
3—Latch (4)
4—Ring (4)
5—Air conditioning filter 4130-269-6242 (2)

Figure 146 (U). Trailer mounted director and tracking stations—typical partial right side view (U).

(*c*) Remove the filter from trichloroethane and place in a horizontal position until thoroughly dry.

(*d*) Discard trichloroethane and clean pan assembly.

(3) *Charging of air conditioning filters.*

Note. Use of lubricating oil 9150-265-9432 for ambient temperatures between −45° F (42.8° C) and +19° F (−7.2° C) and lubricating oil 9150-265-9439 for ambient temperatures above +19° F (−7.2° C).

(*a*) Fill pan assembly 4925-217-2220 to a depth of approximately 2 inches with the appropriate lubricating oil.

(*b*) Immerse the clean air conditioning filter in oil.

(*c*) Remove the filter from oil and place in a horizontal position to drain for 24 hours.

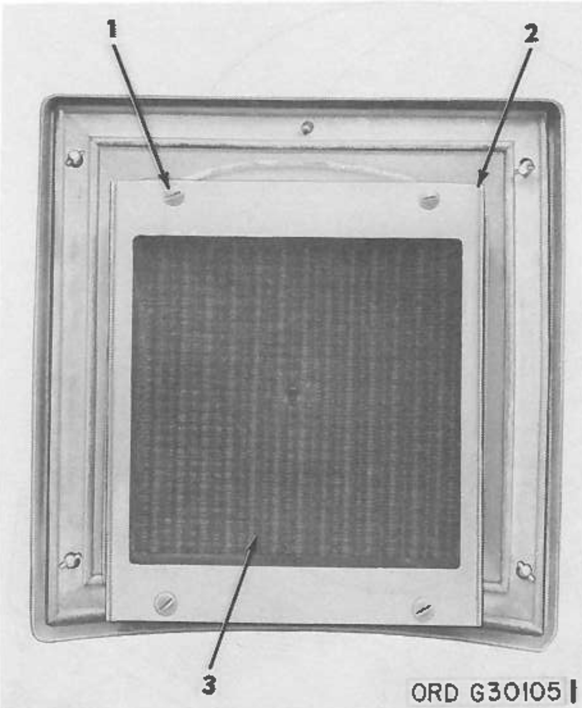
(*d*) If filter is not installed immediately after draining, wrap in greaseproof paper until needed.

(4) *Installation of the air conditioning filters.*

(*a*) Install each air conditioning filter (5) with rings (4) to outside.

(*b*) Secure each filter with latches (3).

Note. The EQUIPMENT COOLING INTAKE door should normally be left open.



1—Captive fastener (4)
2—Ret. frame assy
3—Air filter 1285-692-1461

Figure 147 (U). Cover assembly—typical inside view (U).

b. L O P A R Antenna-Receiver-Transmitter Group.

(1) *Removal of air filters.*

(*a*) Release the captive fasteners and remove the filter access covers (figs. 41, 42, and 43).

(*b*) Release the captive fasteners (1, fig. 147) and remove the retainer frame assembly (2, fig. 147).

(*c*) Remove the air filter (3, fig. 147).

(2) *Cleaning of the air filters.* Clean the air filter as prescribed in *a*(2) above.

(3) *Charging of the air filters.* Charge the air filter as prescribed in *a*(3) above.

(4) *Installation of the air filters.*

(*a*) Install and secure the air filter and retainer frame assembly.

(*b*) Install and secure the filter access covers.

c. Missile Track and Target Track Antenna-Receiver-Transmitter Groups.

(1) *Azimuth drive equipment enclosure.*

(*a*) *Removal of the filter unit.*

1. Loosen the captive fasteners (1, fig. 148) and open the filter frame assembly (2).

2. Remove the filter unit (3) from the filter frame assembly.

(*b*) *Cleaning of the filter unit.* Rap the filter unit to remove excess contaminates. Remove the pliable noncellular polyurethane filter from the frame and flush this material opposite the air flow direction with a jet of water from a hose. Then wash the filter with warm water and a mild detergent. Rinse the filter material thoroughly with water and allow it to dry completely. Install the filter in the frame.

(*c*) *Charging of the filter unit.* Charging the filter is not required.

(*d*) *Installation of the filter unit.*

1. Position the filter unit in the filter frame assembly.

2. Close and secure the filter frame assembly.

***Warning:* Before working on or around the track antenna pedestal, engage azimuth transit lock by loosening the hexagon-head bolt and engaging the azimuth antirotational lock with the track antenna pedestal and tightening the hexagon-head bolt to prevent accidental movement of the pedestal, which might cause injury to personnel.**

(2) *Track antenna pedestal.*

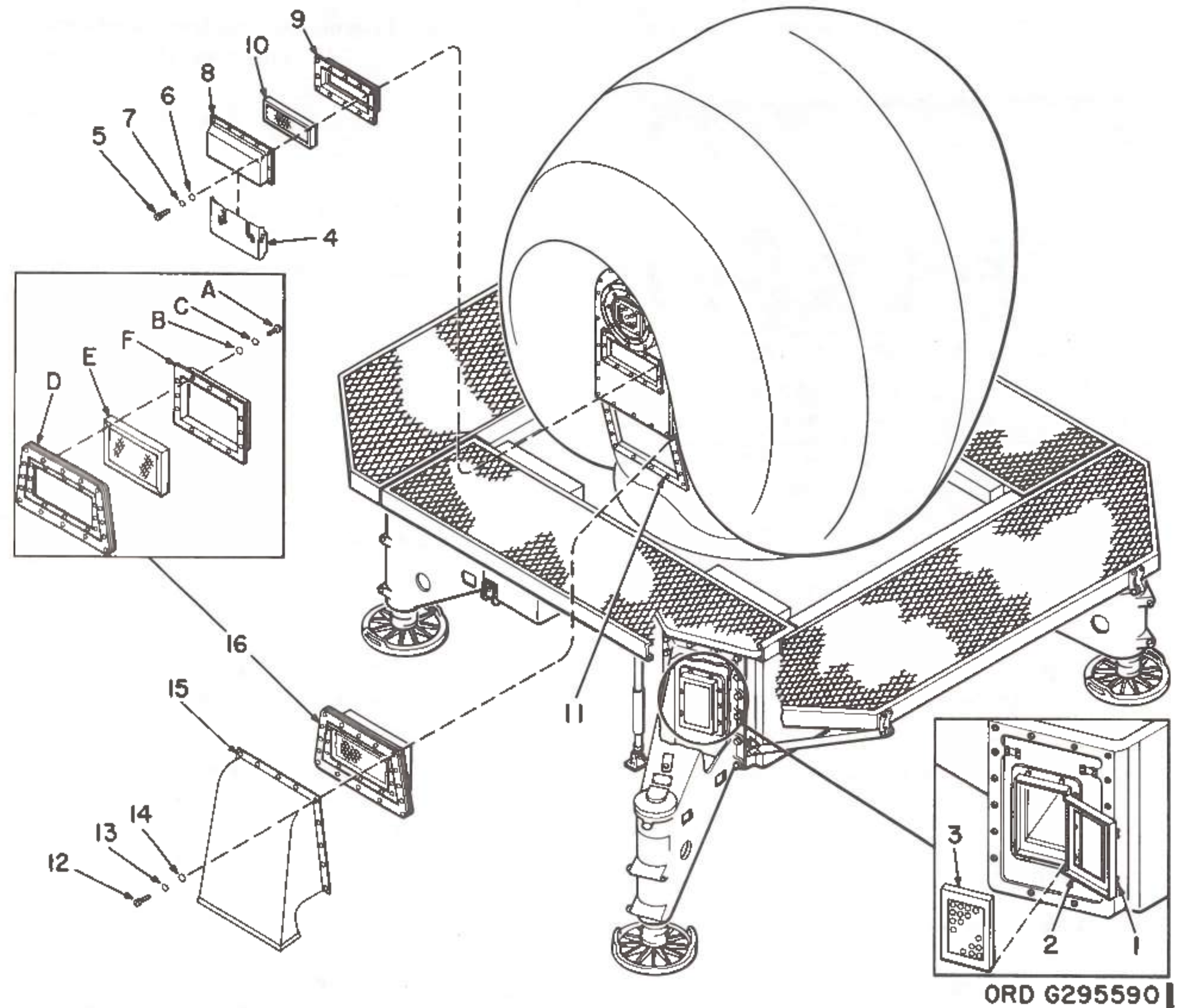
(*a*) *Removal of the upper air conditioning filter.*

1. Remove the shield (4).

2. Remove the fillister-head screws (5), flat washers (6), lock washers (7), cover (8), and filter holder assembly (9).

3. Remove the air conditioning filter (10) from filter holder assembly.

(*b*) *Cleaning of the filter unit.* Rap the filter unit to remove excess contaminates. Remove the pliable noncellular polyurethane filter from the frame and flush this material opposite the air flow direction with a jet



1—Captive fastener (2)
2—Filter frame assy
3—Filter unit 10167487
4—Shield
5—No. 10-24 x 7/16 fil-hd screw 9407614 (12)
6—7/32 in. id fl washer 446161 (12)
7—No. 10 lock washer MS35338-24 (12)
8—Cover 9004340
9—Filter holder assy 9004363
10—Air conditioning filter 10167572
11—Track antenna pedestal
12—5/16-18 UNC-2A x 1-1/8 socket-hd cap screw 10015277 (16)
13—5/16 in. lock washer MS35338-26 (16)
14—5/16 in. id fl washer MS27183-12 (16)
15—Dehumidifier subassy 10167519
16—Air conditioning filter assy 9004366
A—No. 10-24 x 1/2 pan-hd screw MS35206-263 (12)
B—0.437 in. id fl washer MS27183-8 (12)
C—No. 10 lock washer MS35338-24 (12)
D—Frame assy
E—Air conditioning filter 10167483
F—Frame 8171794

Figure 148 (U). Missile track and target track antenna-receiver-transmitter groups—typical partially exploded view (U).

of water from a hose. Then wash the filter with warm water and a mild detergent. Rinse the filter thoroughly with water and allow it to dry completely. Install the filter in the frame.

(c) *Charging of the filter unit.* Charging the filter is not required.

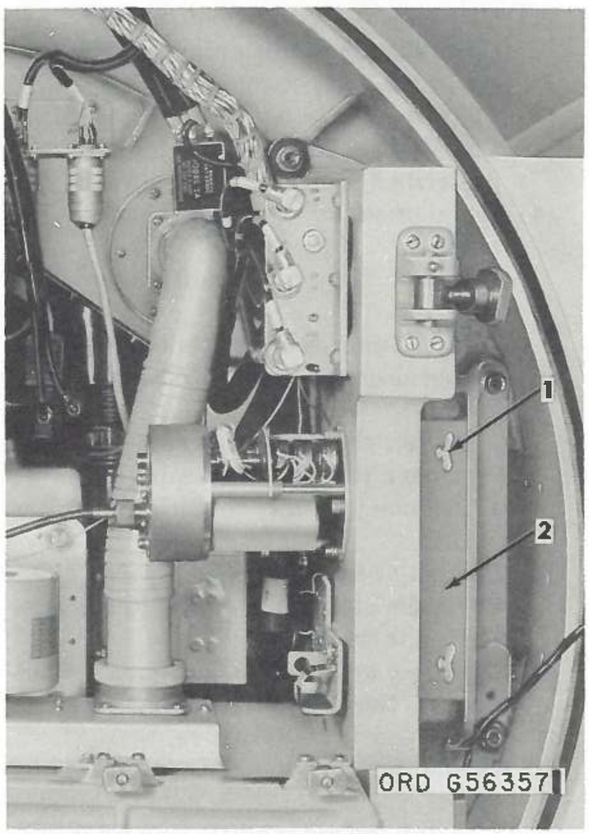
(d) *Installation of the upper air conditioning filter.*

1. Place the air conditioning filter (10) in the filter holder assembly.

2. Install and secure the filter holder assembly and cover (8) on the track antenna pedestal (11).

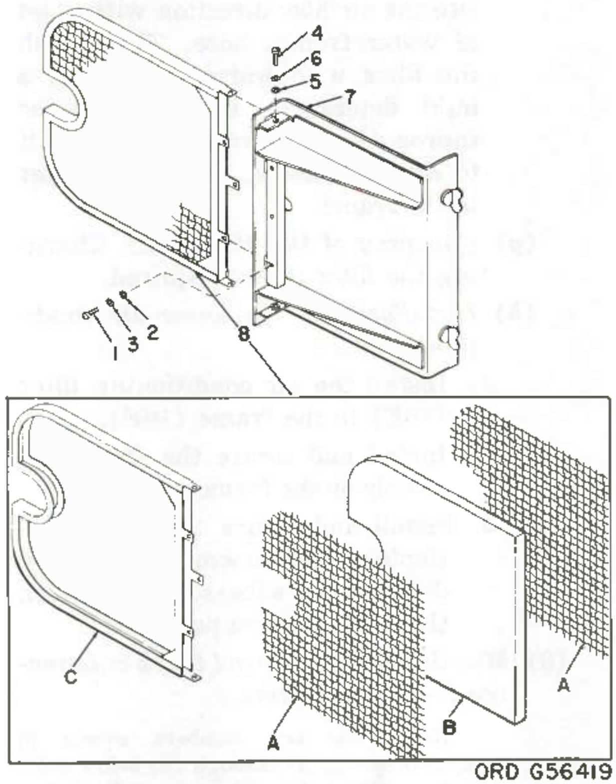
3. Install the shield (4).

(e) *Removal of the lower air conditioning filter.*



1—Captive fastener (2)
2—Air conditioning filter assy 8171042 (2)

Figure 149 (U). Missile track and target track antenna-receiver-transmitters—typical partial rear interior view (U).



1—No. 6-32 x 1/2 fil-hd screw 5303-013-1899 (3)
2—5/32-in-id fl washer 5310-013-1014 (3)
3—No. 6 lock washer 5310-045-0591 (3)
4—No. 6-32 x 5/16 fil-hd screw 5303-013-1885 (2)
5—5/32-in-id fl washer 5310-013-1014 (2)
6—No. 6 lock washer 5310-045-0591 (2)
7—Bracket 8171044
8—Filter frame assy 9000044
A—Wire fabric 8174183 (2)
B—Air conditioning filter 4130-561-7989
C—Filter frame 8171043

Figure 150 (U). Air conditioning filter assembly—exploded view (U).

1. Remove the socket-head cap screws (12), flat washers (14), lock washers (13), dehumidifier subassembly (15), and air conditioning filter assembly (16).

2. Remove the pan-head screws (16A), flat washers (16B), lock washers (16C), frame assembly (16D), and air conditioning filter (16E) from the frame (16F).

(f) *Cleaning of the filter unit.* Rap the filter unit to remove excess contaminants. Remove the pliable non-cellular polyurethane filter from the frame and flush this material opposite the air flow direction with a jet of water from a hose. Then wash the filter with warm water and a mild detergent. Rinse the filter thoroughly with water and allow it to dry completely. Install the filter in the frame.

(*g*) *Charging of the filter unit.* Charging the filter is not required.

(*h*) *Installation of the lower air conditioning filter.*

1. Install the air conditioning filter (16E) in the frame (16F).

2. Install and secure the frame assembly on the frame.

3. Install and secure the air conditioning filter assembly (16) and dehumidifier subassembly (15) on the track antenna pedestal.

(3) *Missile track and target track antenna-receiver-transmitters.*

Note. The key numbers shown in parentheses in (a) through (d) below refer to figure 150 unless otherwise indicated.

(*a*) *Removal of the air conditioning filter.*

1. Gain access to the air conditioning filter assembly (2, fig. 149) in missile track and target track antenna-receiver-transmitter.

2. Loosen the captive fasteners (1, fig. 149) and remove the air conditioning filter assembly.

3. Remove the fillister-head screws (1 and 4), flat washers (2 and 5), and lock washers (3 and 6); separate the bracket (7) from the filter frame assembly (8).

4. Remove the wire fabric (8A) and air conditioning filter (8B) from the filter frame (8C).

(*b*) *Cleaning of the filter unit.* Clean the filter as prescribed in *a*(2) above.

(*c*) *Charging of the filter unit.* Charge the filter unit as prescribed in *a*(3) above.

(*d*) *Installation of the air conditioning filter.*

1. Install the air conditioning filter (8B) and wire fabrics (8A) in the filter frame (8C).

2. Secure the filter frame assembly to the bracket.

3. Install and secure the air conditioning filter assembly (2, fig. 149).

4. Close and secure the cover assembly and radome door.

d. Radar Test Set.

(1) *Removal of the rear air conditioning filter.*

(*a*) Loosen the captive screws (1, fig. 151) and remove the hood assembly (2).

(*b*) Remove the air conditioning filter (3).

(2) *Cleaning of the air conditioning filter.* Clean the air conditioning filter as prescribed in *a*(2) above.

(3) *Charging of the air conditioning filter.* Charge the air conditioning filter as prescribed in *a*(3) above.

(4) *Installation of the air conditioning filter.*

(*a*) Install the air conditioning filter (3).

(*b*) Install and secure the hood assembly.

(5) *Removal of the lower air conditioning filter.*

(*a*) Loosen the captive screws (4) and remove the plate assembly (5).

(*b*) Remove the air conditioning filter (6).

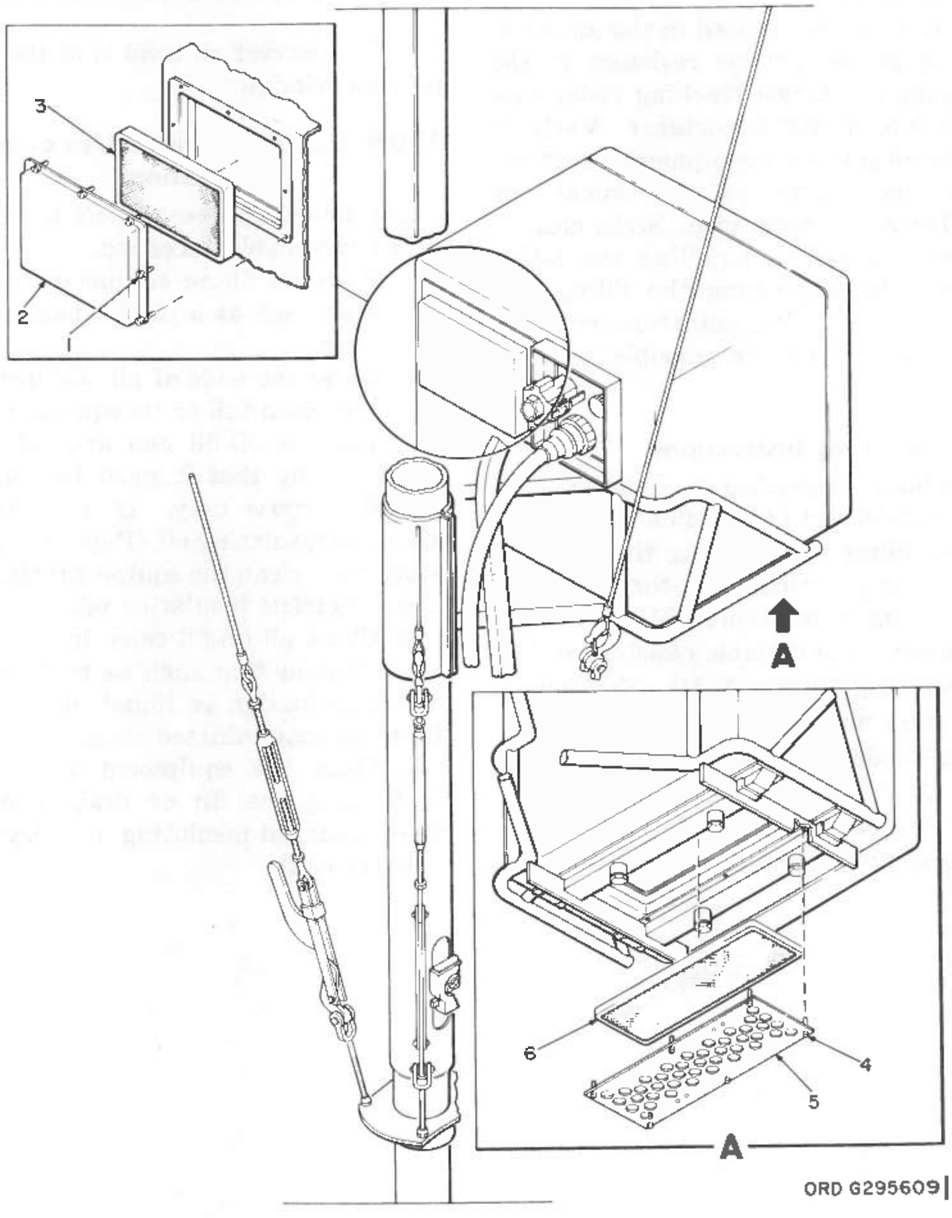
(6) *Cleaning of the air conditioning filter.* Clean the air conditioning filter as prescribed in *a*(2) above.

(7) *Charging of the air conditioning filter.* Charge the air conditioning filter as prescribed in *a*(3) above.

(8) *Installation of the air conditioning filter.*

(*a*) Install the air conditioning filter (6).

(*b*) Install and secure the plate assembly.



1—Captive screw (7)
2—Hood assy 8024177
3—Air conditioning filter 4130-322-7800

4—Captive screw (6)
5—Plate assy 8024175
6—Air conditioning filter 4130-322-779

Figure 151 (U). Radar test set group—partially exploded view (U).

Section VI (U). SERVICING OF OIL-FILLED VARIABLE RESISTORS

130.7 (U). General

Contamination of the oil used in the azimuth, elevation, and range variable resistors in the missile tracking and target tracking radar systems is a problem of vital importance. Variable resistors, like all precision equipment, must operate in an uncontaminated environment or suffer short life as a consequence. Strict cleanliness must be followed in handling the filling equipment and in performing the filling and draining procedures. Contamination must be controlled by the personnel responsible for these operations.

130.8 (U). Servicing Instructions

The procedures prescribed in chapter 4 in TM 9-1430-253-20 and LO 9-1430-250-20 will be followed in filling and draining the azimuth, elevation, and range variable resistors. In addition, the following instructions will be utilized:

a. All oil used in the variable resistors will be electrical insulating oil (Bayol D). The following Federal stock numbers apply:

FSN 9160-663-1360 (1 qt)
FSN 9160-663-9841 (1 gal)
FSN 9160-663-9837 (5 gal)

b. Clean the fill or drain equipment before connecting it, using clean electrical insulating oil.

c. The correct oil level is at the center of the oil-view window.

130.9 (U). Storage and Use of Servicing Equipment

The following precautions must be observed by all personnel concerned:

a. Store all filling equipment in a dustproof container, such as a plastic bag, and seal when not in use.

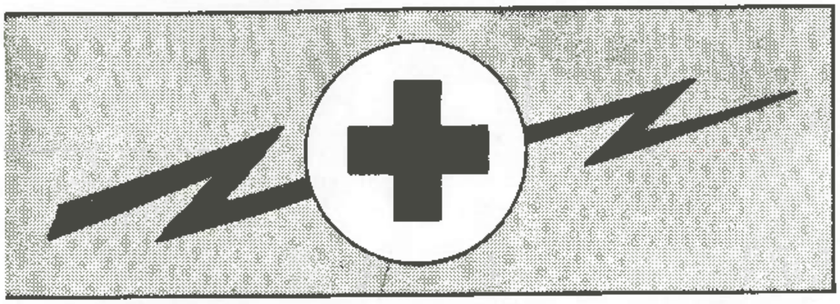
b. Cover the ends of all oil-filled hoses not in use. Use clean foil or its equivalent.

c. Tag the oil-fill can and all oil-fill equipment, stating that it must be used for its intended purpose only. If any oil other than electrical insulating oil (Bayol D) is used in this equipment, clean the equipment thoroughly with clean electrical insulating oil.

d. Check all oil-fill cans, including new ones, for contamination such as rust, corrosion, etc. If contamination is found, do not use the oil from the contaminated cans.

e. Clean the equipment immediately after performing the fill or drain procedure. Use clean electrical insulating oil. Dry with a clean lint-free cloth.

WARNING



RA PD 404264

HIGH VOLTAGE

is used in the operation of this equipment

DEATH ON CONTACT

may result if personnel fail to observe safety precautions

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections for 115 volt ac input connection when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

EXTREMELY DANGEROUS POTENTIALS

greater than 500 volts exist in the following units:

- Missile track antenna-receiver-transmitter group
  - Track receiver-transmitter
  - Track trigger amplifier
- Target radar control console
  - Azimuth indicator
  - Elevation indicator
  - Precision indicator
  - PPI
  - Range indicator
  - Target track control power supply
- Target track antenna-receiver-transmitter group
  - Track receiver-transmitter
  - Track trigger amplifier
- Acquisition antenna-receiver-transmitter group
  - Acquisition modulator
  - Acquisition receiver-transmitter
- Battery control console
  - Precision indicator
  - PPI
  - PPI HV power supply
- Director station group
  - Acquisition HV power supply
  - MTI oscilloscope
- Missile radar control console
  - Missile track control power supply
  - Range indicator

Warning: **Potentials less than 500 volts may cause death under certain conditions. Reasonable precautions should be taken at all times.**

NIKE-HERCULES RADIO-FREQUENCY RADIATION HAZARD

Radio-frequency radiations from radar antennas and associated equipment could present a potential hazard to battery personnel. The effect of rf radiation is not cumulative but it could be hazardous. RF radiation heats the body tissues and when the intensity is high may produce enough heat to damage the tissues permanently. Damage to the body tissue is not immediately apparent. Precautions should be taken to insure that personnel are not exposed to rf radiations of hazardous intensity levels.

A power level of 0.01 watt per square centimeter, although not considered potentially hazardous, is stipulated by AR 40-583 as the maximum permissible exposure level for personnel subjected to rf radiation fields. Personnel should not be permitted to enter areas where they may be exposed to levels above 0.01 watt per square centimeter.

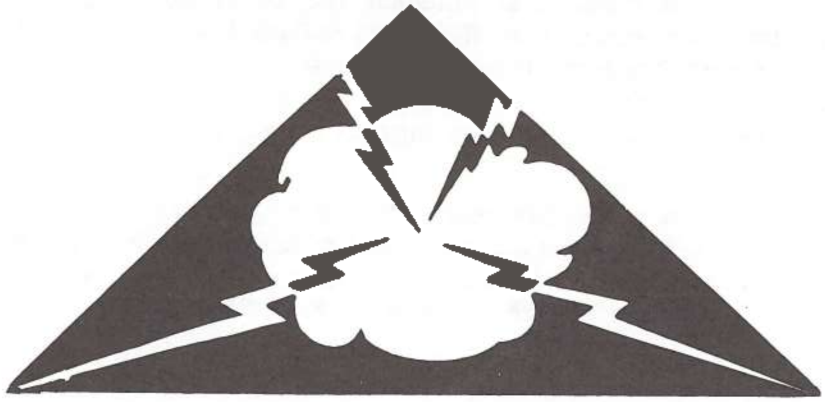
A power intensity of 0.01 watt per square centimeter is present along the axis of the transmitted beam at the following distances from NIKE-HERCULES radar antennas. In each instance, the intensity rapidly diminishes as the distance is increased.

Antenna	*Distance*
Acquisition Radar-Non Scanning	125 feet
Missile Tracking Radar-NIKE AJAX Mode	255 feet

The intensity of the beam from the target tracking radar, the acquisition radar when scanning, and the missile tracking radar in the NIKE-HERCULES mode is inconsequential under operational conditions.

This information is based upon average power outputs and may be used as a guide to prevent radio-frequency radiation hazards.

W A R N I N G



RA PD 461691

RADIATION HAZARD

This equipment contains the following radioactive tubes:

ATR 5921	5829
ATR 5922	OA2
ATR 6163/428	OA2WA
TR 6164/429	OB2
TR 5927	OB2WA
6167	OC3
395A	

Refer to TB ORD 648 for safety precautions to be exercised in the presence, handling, and disposal of radioactive tubes.

FIRST AID FOR RADIOACTIVE CONTACT

The following first aid procedure for wounds caused by a radioactive particle represents the only reasonable first aid treatment which would normally be available:

a. Immediate application of tourniquet, if the wound is so located that a tourniquet is applicable.

b. Stimulation of mild bleeding by manual pressure about the wound and by the use of suction bulbs.

Warning: **Do not suck the wound by mouth.**

c. The wound must be washed with soap and flushed with plenty of clean water.

d. If the wound is of the puncture type, or if the opening is quite small, an incision should be made to promote free bleeding and to facilitate cleaning and flushing of the wound.

First Aid for Electric Shock

I. GENERAL

a. Rescue. In case of electric shock, shut off the high voltage at once and ground the circuits. If the high voltage cannot be turned off without delay, free the victim from contact with the live conductor as promptly as possible. Avoid direct contact with either the live conductor or the victim's body. Use a dry board, dry clothing, or other nonconductor to free the victim. An axe with a dry wooden handle may be used to cut the high-voltage wire. Use extreme caution to avoid the resulting electric flash.

b. Symptoms.

(1) Breathing stops abruptly in electric shock if the current passes through the breathing center at the base of the brain. If the shock has not been too severe, the breath center recovers after a while and normal breathing is resumed, provided that a sufficient supply of air has been furnished meanwhile by artificial respiration.

(2) The victim is usually very white or blue. The pulse is very weak or entirely absent and unconsciousness is complete. Burns are usually present. The victim's body may become rigid or stiff in a very few minutes. This condition is due to the action of electricity and is not to be considered rigor mortis. Artificial respiration must still be given, as several such cases are reported to have recovered. The ordinary and general tests for death should never be accepted.

II. MOUTH-TO-MOUTH ARTIFICIAL RESPIRATION

Start artificial respiration immediately. Do not wait for a mechanical resuscitator; but when an approved model is available, use it. At the same time send for a medical officer, if assistance is available. Do not leave the victim unattended. Perform artificial respiration at the scene of the accident, unless the victim's or operator's life is endangered from such action. *In this case only,* remove the victim to another location, but no farther than is necessary for safety. If the new location is more than a few feet away, artificial respiration should be given while the victim is being moved. Artificial respiration, once started, must be continued without loss of rhythm. The mouth-to-mouth artificial respiration is described here.

TECHNIQUE OF MOUTH-TO-MOUTH ARTIFICIAL RESPIRATION

Mouth-to-Mouth Artificial Respiration.

1. *Position of Victim* (A) Place victim in the face upward position and kneel close to his left ear.

2. *Clear the Throat.* Turn the head to one side and quickly wipe out any fluid, mucus, or foreign body from mouth and throat with the fingers.

3. *Open and Aline Air Passages.* Tilt the head back and extend the neck to open and aline the air passages, so that they do not become blocked by kinking or pressure.

4. *Lift Jaw Forward.* Place the thumb into the mouth and grasp the jaw firmly. Lift the jaw forward to pull the tongue forward out of the air passage. Do not attempt to hold or depress tongue.

5. *Pinch Nostrils Closed.* Use other hand to keep the victim's nostrils pinched closed to prevent air leak.

6. *Form Tight Seal with Lips* (B). Rescuer's *wide-open* mouth completely surrounds and seals the open mouth of the victim. This is not a kissing or puckered position—the mouth of the rescuer must be wide-open.

7. *Blow.* Exhale firmly into victim's mouth until the chest is seen to lift. This can be seen by the rescuer without difficulty

8. *Remove Mouth and Breathe in* (C) During this time, rescuer can hear and feel the escape of air from the victim's lungs.

9. *Repeat 6, 7, and 8.* Continue at a rate of 12-20 times per minute.

Caution. Excessively deep and rapid breathing by the rescuer may cause him to become faint, to tingle, and even lose consciousness. Breathing should be normal in rate with only moderate increase in volume. In this way, rescue breathing can be continued for long periods without fatigue.

10. *Remember.*

   a. Keep airway clear of fluid and other obstruction.

   b Readjust position if air does not flow freely in and out of victim.

   c. Keep neck extended and chin pulled forward.

   d. Do not breathe too forcibly or too large a volume if victim is infant or small child.

TECHNICAL MANUAL No. 9-1430-250-10

HEADQUARTERS, DEPARTMENT OF THE ARMY
WASHINGTON, D. C. *15 December* 1958

RADAR COURSE DIRECTING CENTRAL (U)

***This manual supersedes TM 9-5090-5-1, 8 July 1957, except Chapter 3; TM 9-5094-1, 11 June 1957, except Sections II and IV of Chapter 3; TM 9-5092-1-1, 15 May 1957, except Sections II and IV of Chapter 3; and TM 9-5092-1-2, 15 May 1957, except Section II of Chapter 3.**

CHAPTER 1 (U)

INTRODUCTION

1 (U). Purpose

The purpose of this manual is to provide information on the operation of the Radar Course Directing Central Air Defense Guided Missile System NIKE-HERCULES, with the exception of voice communication circuits and equipment. This information is intended to provide the necessary instructions and guidance needed by personnel responsible for the operation of the radar course directing central.

2 (U). Scope

a. Information on the operation of the radar course directing central given in this manual includes functional and physical characteristics, individual functions of controls and indicators used by the operator, and all nontactical operations required during energizing, normal operation, and deenergizing. Also included is information on maintenance that is the responsibility of the operator. Operation of the voice communication circuits and equipment is given in TB 9-1400-251-12. Information on detailed operation of the IFF system is given in TM 11-1191. Detailed operation of the SIF/IFF system is given in TB 11-1191-1, TM 11-5840-202-10, and TM 11-5840-204-10. Only the portion applicable to operation of the IFF equipment is given in this manual.

b. This is one of a series of technical manuals on operation, emplacement, and maintenance of the NIKE-HERCULES Air Defense Guided Missile System. Items of the NIKE-HERCULES System and Type 4 Equipment are illustrated in the pictorial index, Appendix I of TM 9-1400-250-10/1. Lists of technical manuals covering these systems are given with the pictorial indexes.

c. Appendix I of this manual contains a list of current references including supply manuals, technical manuals, and other available publications, applicable to the materiel.

d. Appendix II of this manual contains a list of tools, equipment, and repair parts for the operator.

e. Deleted.

f. This manual is technically correct for all NIKE-HERCULES Air Defense Guided Missile Systems provided the pertinent Department of the Army Modification Work Orders (DA MWO's) listed in the remainder of this subparagraph have been incorporated.

(1) ORD Y26-W2 and Y39-W11 adds waveguide switch and dummy load in the monopulse duplexer of the target track receiver-transmitter to permit stopping RF transmission without loss of AFC action (antenna-receiver-transmitter group OA-1485/MPA—systems 1001-1193, target-tracking antenna-receiver-transmitter group OA-1488/MPA—systems 1001-1216, tracking station group OA-1595/MPA-5—systems 1001-1193).

(2) ORD Y26-W10 provides two side personnel platforms and one end platform for the track antenna base on semi-mobile systems (selected systems).

(3) ORD Y26-W11 provides an additional personnel platform and modifies the rear platform of the track antenna base at permanent installations (selected systems).

(4) ORD Y28-W5 adds selective identification facilities and incorporates Mark X IFF equipment (systems 1001 through 1090).

(5) ORD Y28-W11 adds suppression circuits to acquisition radar system to reduce interfering signals and noise (systems 1001 through 1246).

(6) ORD Y28-W16 adds bracket to FUIF interconnecting box cover to prevent damage to the fuse and lamp-holders (systems 1001 through 1218).

(7) ORD Y28-W18 increases flexibility of the computer minimum burst altitude facility and replaces the terrain elevation variable resistor and all the fixed minimum safe burst altitude circuits (systems 1001 through 1193).

(8) ORD Y28-W21 and Y39-W9 extends range of PPI (systems 1001 through 1048).

(9) ORD Y28-W24 and Y39-W15 provides calibration voltage for PPI adjustment and provides means of adjusting the +250 or +150 volt regulators (systems 1001 through 1218).

(10) ORD Y28-W26 modifies the transit time circuits to properly use the anticipated size prime warhead (systems 1001 through 1266).

(11) ORD Y28-W27 modifies the burst time bias and burst enable circuits to make system operation compatible with a new missile timer (systems 1001 through 1266).

(12) ORD Y28-W28 removes NIKE-AJAX cluster and low altitude capabilities from the NIKE-HERCULES System to prevent selection of functions which are not available, and improves system performance against maneuvering targets (systems 1001 through 1266).

(13) ORD Y39-W4 improves track receivers to reduce collimation, drift, and simplifies adjustment procedures (systems 1001 through 1218).

(14) ORD Y39-W10 adds switch guard to radar power control panel (systems 1001 through 1246).

(15) ORD Y28-W29 provides improved symbol intensity control and changes video clamper circuit for better video reproduction (systems 1001 through 1306); changes PPI HV power supply to improve unblanking pedestal (systems 1001 through 1291).

(16) ORD Y28-W34 adds kill switch and present target altitude meter to the tactical control-indicator. Circuit changes are made to protect the ground speed meter and to prevent lock-up of the plotting board pens during pen interchange (systems 1001 through 1306).

(17) ORD Y39-W22 prevents accidental changing of the target oscillator frequency (systems 1001 through 1286).

(18) ORD Y28-W38 reduces possibility of accidentally setting MISSION switch to SS (systems 1001 through 1316).

(19) ORD Y28-W40 and Y39-W25 adds coordinate locking switches and circuits for surface-to-surface missions (systems 1001 through 1346).

(20) 9-1430-251-30/8 adds the necessary wiring to the battery control console and the computer group to permit connection of radar bomb scoring equipment to the NIKE-HERCULES system (systems 1001 through 1362).

(21) 9-1400-263-50 adds facilities to permit use of an auxiliary acquisition radar (AAR) (selected systems).

(22) ORD Y28-W35 and Y39-W23 adds facilities to permit use of radar signal simulator (selected systems).

(23) 9-1400-262-30 adds facilities for maintaining the frequency of the missile tracking radar transmitter at a predetermined value (systems 1001 through 1362).

(24) 9-1430-268-50 provides antijam display capabilities to the NIKE-HERCULES acquisition radar (production cut-in system 1363 and above and seselected systems for systems 1362 and below).

(25) 9-1430-251-30/16 improves tactical signaling and FUIF displays by adding VALIDITY switch and by adding BOTH switch position to control-indicator. Replaces HV connectors and eliminates safety hazard and capacitor failure in azimuth and range indicator (systems 001-128).

(26) ORD Y39-W5 improves video gain in the target tracking radar system. Adds video amplifier, control switch, and indicator light (systems 1001-1246).

(27) 9–1400–250–50/25 updates the NIKE–HERCULES system to provide compatibility with the radar signal simulator station AN/MPQ–T1 (T1 trainer) and adds functions for annual service practice (all systems).

(28) 9–1400–250–30/40 provides "target tracked" indication to fire unit integration facility (FUIF) equipment during radar bomb scoring mission (systems 1001 through 1393).

(29) 9–1400–250–50/43 adds a SIMULATE indicator light to indicate when a firing simulator or flight simulator is in use in the launching area (systems 1001 through 1393).

g. For a complete list of DA MWO'S applicable to the system, refer to DA PAM 310–4.

h. This technical manual supersedes information presently contained in TM 9–5092–1–1, TM 9–5094–1, TM 9–5092–1–2, and TM 9–5090–5–1.

3 (U). Nomenclature

Table 1 is a cross-reference index of TM, official, and contractor's nomenclature for those items of the NIKE–HERCULES Air Defense Guided Missile System referenced in this manual. The purpose of the table is to introduce TM and official nomenclature to those field personnel who are familiar with contractor's nomenclature only. When the TM, official, and contractor's nomenclature for an item is the same, this item will not appear in the nomenclature cross-reference index.

Next Numbered page is 8.

Table I (U). Nomenclature Cross-Reference

TM nomenclature	Official nomenclature	Contractor's nomenclature
Acquisition antenna	Antenna	Acquisition antenna
Acquisition antenna	Antenna AT-779/T	Acquisition antenna
Acquisition antenna pedestal	Antenna pedestal AB-544/T	Acquisition antenna pedestal
Acquisition antenna-receiver-transmitter group	Acquisition antenna-receiver-transmitter group OA-1596/T	Acquisition antenna assembly
Acquisition control-indicator	Control-indicator (Acquisition and IFF)	Acquisition control panel
Acquisition modulator	Radar modulator MD-311/T	Acquisition modulator
Acquisition orientation level	Surveying level TS-844/MS	Acquisition orientation test set
Acquisition receiver-transmitter	Radar receiver-transmitter RT-430/T	Acquisition rf coupler
Acquisition RF power supply control	Power supply control	Acquisition rf power control
AC regulator[1]		
A_G, B, and T_D computer	Ballistics computer	AG, ballistic, and dead time servo
AGC monitor amplifier	Electronic control amplifier	AGC monitor
Altitude plotting board	Computer data plotting board (altitude)	Altitude plotting board
Antenna and mast group OA-1600/T	Antenna and mast group OA-1600/T	Radar test mast assembly
Antenna base	Antenna base	Tracking antenna mount assembly
Antenna mount drop bed trailer	Antenna mount low bed trailer XM406	Tracking antenna trailer
Antenna pedestal leg	Antenna pedestal leg MT-1448/MS	Antenna mounting leg
Army Air Defense Fire Distribution system, Missile Master (AN/FSG-1)[1]		

See footnote at end of table.

Figure 1. Deleted.

Table I. Nomenclature Cross-Reference - Continued

TM nomenclature	Official nomenclature	Contractor's nomenclature
Army Air Defense Fire Distribution System Missile Monitor (AN/MSG-4) [1]		
Azimuth and elevation deviation indicator	Azimuth and elevation deviation indicator ID-429/M	Target tracking meter panel
Azimuth indicator	Azimuth indicator (track)	Tracking azimuth indicator
Battery control console	Battery control console OA-1481/MSA-19	Battery control console assembly
Battery control interconnecting box housing	Junction box housing	Junction box housing
Battery signal panel-indicator	Panel-indicator (status)	Battery status control-indicator
Battery status panel [1]		
C rack ground slant range computer [1]		
Centrifugal fan	Centrifugal fan	Blower
Climb and turn computer	Ballistics computer	Climb and turn servo assembly
Coder-decoder group AN/MSQ-18 [1]		
Command oscilloscope	Oscilloscope OS-49/M	Command calibrator
Compressor	Motor driven reciprocating compressor	Pressurization unit
Computer amplifier-relay group	Amplifier-relay group (computer) OA-1915-MSA-19	Computer amplifier cabinet assembly
Computer control-panel	Control-panel (computer)	Computer control panel
Computer group	Ballistics data computer group OA-1482/MSA-19	Computer assembly
Computer power supply group	Power supply group OA-1527/MSA-19	Computer power cabinet assembly
Computing amplifier	Direct current amplifier AM-1093/M	DC amplifier
Coordinate data pallet [1]		
Coordinate data set AN/TSQ-8 [1]		
Data converter and test panel [1]		
Director station trailer	Director station van trailer XM424	Unequipped director station trailer
Director station group	Director station group OA-1480/MSA-19	Acquisition radar cabinet assembly
D rack status and power control [1]		
Early warning plotting board	Radar data plotting board PT-414/MSA-19	Early warning plotting board
Elevation indicator	Elevation indicator (track)	Tracking elevation indicator
Electric light control	Electric light control C-1473/M	Panel lights control

[1] See footnote at end of table.

Table I. Nomenclature Cross-Reference - Continued

TM nomenclature	Official nomenclature	Contractor's nomenclature
Equipment cooling cabinet	Electrical equipment cabinet CY-2087/M	Equipment cooling cabinet assembly
Equipment cooling fan	Centrifugal fan HD-167/M	Blower assembly
Fire Unit Integration Facility [1]		
FUIF interconnecting box	Interconnecting box J-851/MSA-19	Interconnecting box
FUIF interconnecting box cover	Interconnecting box cover CW439/MSA-19	Interconnecting box cover
FUIF truck [1]		
Fuse and control panel	Fuse panel	Fuse and control panel
Heater assembly control unit	Heater control unit	Heater control unit
Horizontal plotting board	Computer data plotting (horizontal range)	Horizontal plotting board
Missile control-indicator group	Control-indicator group	Missile tracking equipment drawer
Missile oscillator	Rf oscillator	Missile rf oscillator
Missile radar control console	Radar control console OA-1341/MPA	Missile tracking console assembly
Missile track antenna-receiver-transmitter	Missile tracking antenna-receiver-transmitter OA-1486/MPA	Missile tracking antenna assembly
Missile track antenna-receiver-transmitter group	Missile tracking antenna-receiver-transmitter group OA-1485/MPA	Missile tracking antenna assembly
Missile track control drawer	Missile track control drawer	Missile tracking control drawer
Missile track control power supply	Power supply	Missile tracking control panel
Missile track indicator	Azimuth and elevation indicator ID-430/MPA-4	Missile indicating panel
Operation Center [1]		
Personnel heater	Vehicular compartment heater	Heating and ventilating cabinet assembly
Power control panel [1]		
PPI	Azimuth and range indicator	PPI
Precision indicator	Azimuth and range indicator	Precision indicator
Problem unit [1]		
Radar coder set	Rader coder set KY-229/MPA	NIKE B coder set
Radar course directing central	Radar course directing central AAGMS NIKE-HERCULES	
Radar power control panel	Power supply control panel	Radar power control panel
Radar power supply group	Power supply group OA-1342/MPA	Radar power cabinet assembly
Radar set group	Radar set group	Radar range and receiver cabinet assembly
Radar test set TS-847A/MSW-1	Radar test set TS-847A/MSW-1	RF radar test set
Range computer [1]		
Range indicator	Range indicator	Tracking range indicator
Range position transmitter	Position transmitter	Range drive unit

[1] See footnote at end of table.

Table I (U). Nomenclature Cross-Reference—Continued *(U).*

TM nomenclature	Official nomenclature	Contractor's nomenclature
Recorder group	Recorder group OA-1483/MSW-19	Event recorder and switchboard cabinet assembly
STC	Receiver control	Sensitivity time control
Servo computer assembly	Computer assembly	Computer servo cabinet assembly
Summing amplifier [1]		
Tactical control-indicator	Control-indicator (tactical)	Tactical control-indicator
Target designate control-indicator	Control-indicator	Target designate control panel
Target oscillator	RF oscillator	Target rf oscillator
Target radar control console	Radar control console OA-1484/MPA	Target tracking console assembly
Target track antenna-receiver-transmitter group	Target tracking antenna-receiver-transmitter group OA-1488/MPA	Target tracking antenna assembly
Target test control	Radio beacon control C-1472/M	Target test panel
Target track control drawer	Target track control drawer	Target tracking control drawer
Target track control power supply	Power supply	Target tracking control panel
Target track indicator assembly	Indicator assembly ID-428/M	Target tracking signal panel
Test set monitor indicator panel	Indicator panel	Indicator panel
Test scope and test scope cart [1]		
Track antenna pedestal	Antenna pedestal	Antenna pedestal
Track antenna radome	Track radome	Track antenna radome
Track antenna reflector assembly	Track reflector assembly	Tracking lens assembly
Track receiver-transmitter	Radar receiver-transmitter	Tracking rf unit
Tracking station trailer	Radar tracking van trailer XM428	Unequipped tracking station trailer
Trailer mounted director station	Trailer mounted director station AN/MSA-19	Director station
Trailer mounted missile track antenna-receiver-transmitter group	Trailer mounted missile tracking antenna-receiver-transmitter group OA-1340/MPA	Missile antenna trailer equipped
Trailer mounted target track antenna-receiver-transmitter group	Trailer mounted target tracking antenna-receiver-transmitter group OA-1487/MPA	Target antenna trailer equipped
Trailer mounted tracking station	Trailer mounting tracking station AN/MPA-5	Tracking station
Utility cabinet	Electrical storage cabinet CY-1515/M	Utility cabinet assembly
Zero-set switch	Rotary switch SA-393/M	Zero-set switch

[1] FUIF equipment nomenclature.

4 (U). Abbreviations

The abbreviations used in this manual are listed below.

AADCP	— Army Air Defense Command Post
AADFDS	— Army Air Defense Fire Distribution System
AFC	— automatic frequency control
AGC	— automatic gain control
A_G	— gyro azimuth
DA MWO	— Department of Army Modification Work Order
ECCM	— electronic countermeasures
FLI	— flight leader identification
FUIF	— fire unit integration facility
GCO	— guidance cutoff
GTC	— gain time constant
IF	— intermediate frequency
IFF	— identification friend or foe
LEC	— low elevation compensation
MTI	— moving target indicator
OC	— Operation Center
PI	— personal identification
PPI	— plan position indicator
RCDC	— radar course directing central
RF	— radio frequency
SIF/IFF	— selective identification feature/identification friend or foe
STC	— sensitivity time control

5 (U). Maintenance Allocation for the Operator

In general, the prescribed maintenance responsibilities of the operator are reflected in the allocation of tools and repair parts as listed in TM 9-1430-250-12P/2/2, TM 9-1430-250-12P/3/2, TM 9-1430-250-12P/4/2, and TM 9-1430-250-12P/5/2. Normally, operator maintenance may be performed only under the supervision of a trained organizational maintenance technician. In all cases where the nature of repair, modification, or adjustment is beyond the scope of the maintenance technician, the supporting Ordnance maintenance unit should be informed so that personnel with suitable tools and equipment may be provided or other proper instructions issued.

6 (U). Forms, Records, and Reports

Refer to TM 38-750 for instructions on the use and completion of all forms required for operating and maintaining the equipment.

6.1 (U). Comments, Criticisms, and Corrections

a. Your ideas and comments on this manual are wanted. If you see errors or have suggestions to improve the way information is presented, write directly to Commanding General, U. S. Army Missile Command, Redstone Arsenal, Alabama, Attention: AMSMI-SMPT.

b. Comments may be in pencil and informal, but use DA Form 2028 if available. Replies will be sent directly to the originator of comments.

CHAPTER 2 (CMHA)
FUNCTIONAL DESCRIPTION OF THE RADAR COURSE DIRECTING CENTRAL

Section I (CMHA). INTRODUCTION

7 (U). Purpose

The radar course directing central (RCDC) functions as the command and control center of the NIKE-HERCULES Air Defense Guided Missile System. The RCDC detects, identifies, and tracks airborne targets, and guides NIKE-AJAX or NIKE-HERCULES missiles to intercept and destroy hostile targets. The RCDC may also be conditioned to operate against surface targets.

8 (CMHA). Capabilities

The RCDC can detect targets up to a range of 250,000 yards when using the Nike acquisition radar (NAR) system and up to a range of 400,000 yards when using the auxiliary acquisition radar (AAR) system. The RCDC can track targets up to a range of 200,000 yards. With the addition of anti-jam display (AJD) capabilities, the RCDC can detect and track targets even when the NAR system is exposed to an extremely high level of transmission jamming. The RCDC provides guidance for NIKE-HERCULES missiles during three types of missions: surface-to-air, surface-to-air low altitude, and surface-to-surface. The RCDC provides guidance for NIKE-AJAX missiles during surface-to-air missions only. The RCDC can also be used for radar scoring of simulated bombing runs. The general capabilities of the RCDC are described in *a* through *f* below.

a. Surface-to-Air-Mission. The RCDC guides a NIKE-HERCULES missile to intercept and destroy entire aircraft formations traveling at speeds up to 2000 knots (fig. 2), ranges in excess of 150,000 yards, and altitudes up to 100,000 feet. The missile can attain a maximum velocity of 2250 knots and has a maneuverability adavntage over all known manned aircraft; however, an intercept cannot be made within the dead zone surrounding the missile launcher. This dead zone has a ground radius of about 10,000 yards and an altitude of about 20,000 feet. The dead zone is effected by the launch angle and the minimum turning radius of the missile. The RCDC guides a NIKE-AJAX missile to intercept and destroy single aircraft at ranges up to 50,000 yards. Capabilities of the NIKE-HERCULES system against typical targets, during surface-to-air missions, are shown in figure 2.

b. Surface-to-Air Low Altitude Mission. The RCDC guides a NIKE-HERCULES missile to intercept and destroy a low altitude target at ranges up to 100,000 yards (fig. 3) and at altitudes below 5000 feet. The low altitude corridor is below 5000 feet at ranges up to about 20,000 yards, and below 10,000 feet at ranges between 20,000 and 100,000 yards. A delayed start of the missile rocket motor is used to permit a shorter turning radius of the missile. Using a delayed motor start reduces the dead zone to a ground radius of about 5000 yards and an altitude of about 16,000 feet.

c. Surface-to-Surface Mission. The RCDC guides a NIKE-HERCULES missile, armed with a nuclear warhead, to a surface target at a maximum range of 100 nautical miles (fig. 4).

d. Radar Bomb Scoring Mission. The RCDC, when used in a radar bomb scoring mission, accurately plots the course of a bomber making a simulated bombing run and marks the point of the simulated bomb release. From this plot the theoretical bomb impact point is calculated, and the accuracy of the bombing run is determined.

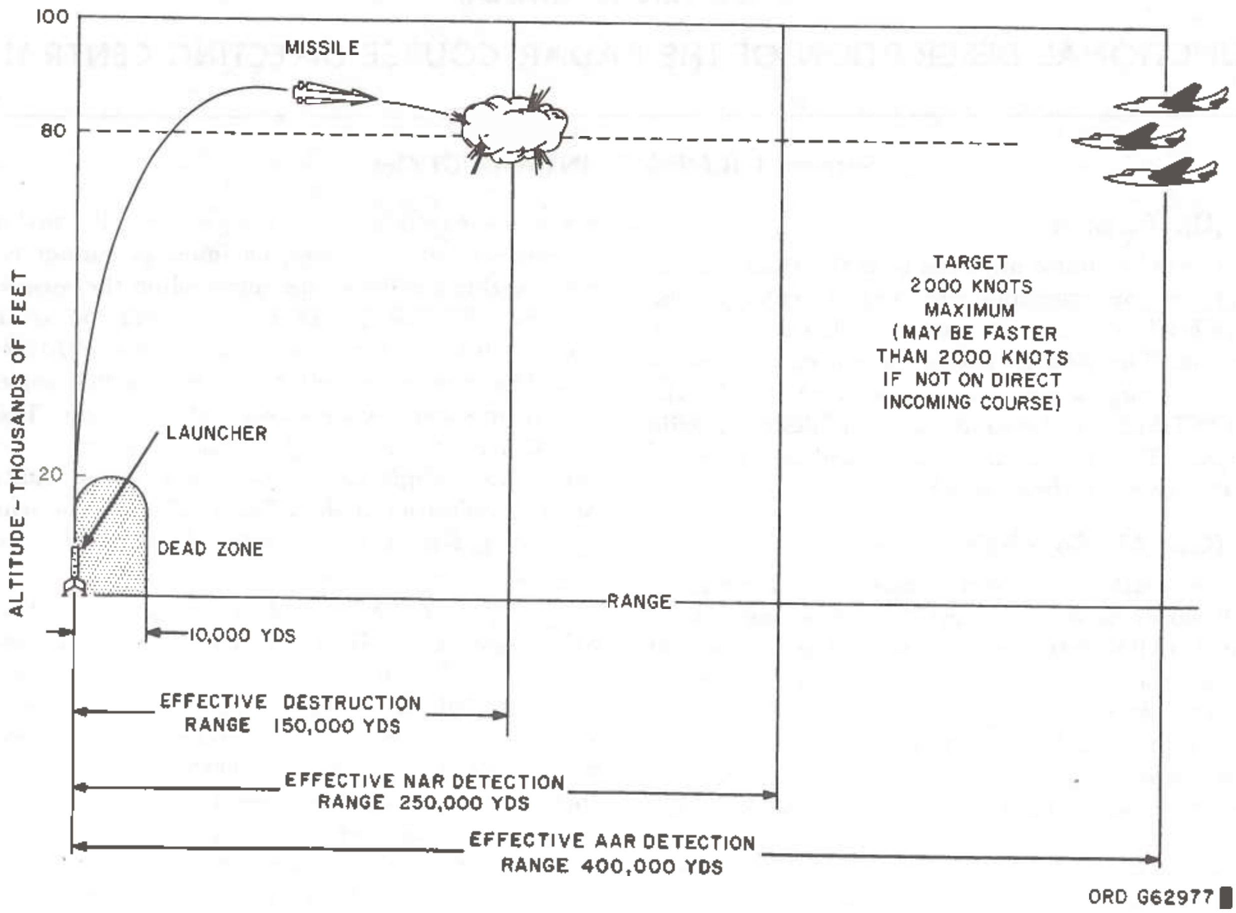


Figure 2 (CMHA). Surface-to-air mission capabilities.

e. Mobility. The equipment comprising the RCDC is trailer mounted and may be permanently emplaced to strategically defend a given area. The equipment may be transported by air as well as by rail, water, or over public roads. When the equipment arrives at its destination it can be emplaced within a few hours. The equipment can also be march ordered within a few hours.

f. Operating Conditions. The RCDC is capable of operating 23 hours a day without impairment of performance, and at least 5000 hours without major overhaul. The RCDC operates efficiently at an ambient temperature range from −40°F to +125°F, relative humidities up to 100 percent, and at altitudes up to 10,000 feet above sea level. Rain, snow, dust, sand, salt air, steady surface winds up to 60 miles per hour, and surface gusts up to 75 miles per hour do not interfere with normal operation.

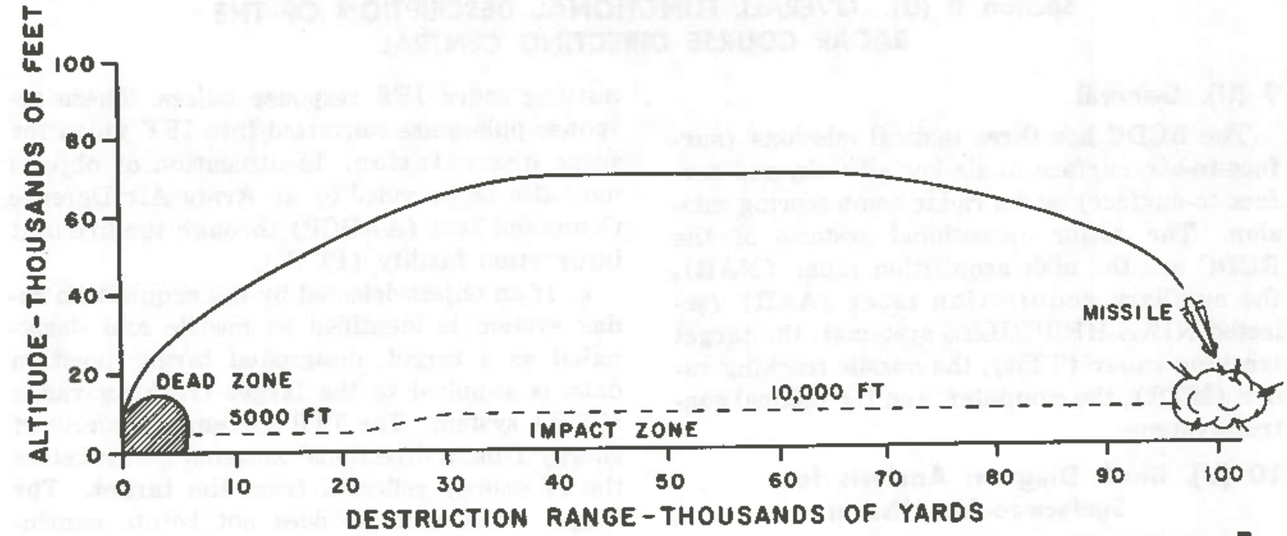


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Figure 3 (CMHA). Surface-to-air-low altitude mission capabilities.

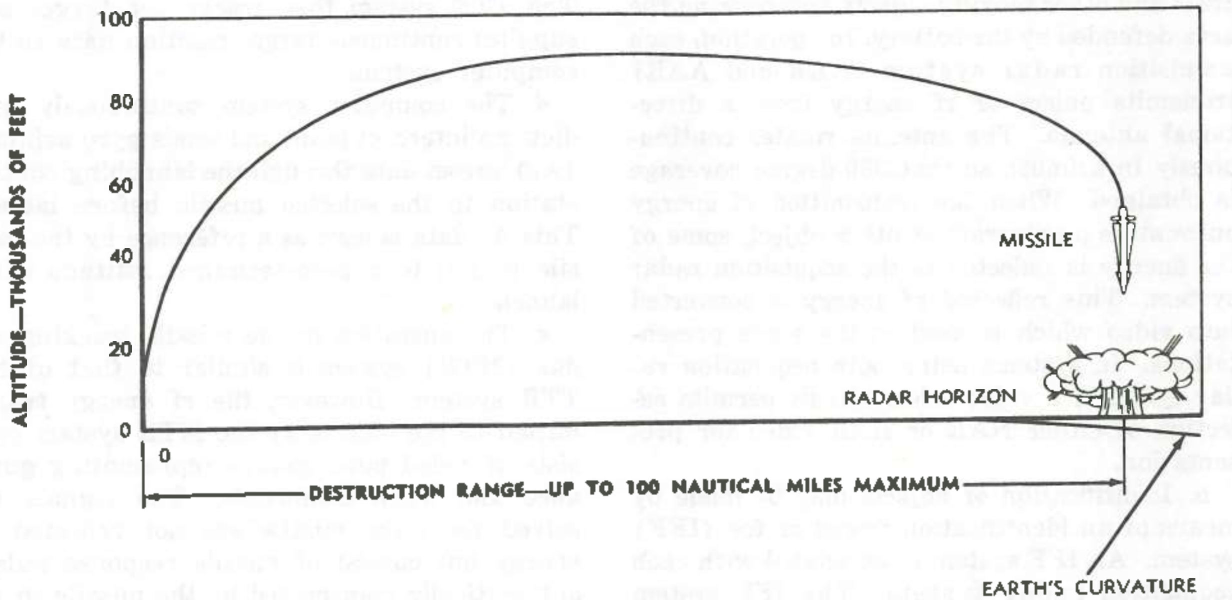

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Figure 4 (CMHA). Surface-to-surface mission capabilities.

Section II (U). OVERALL FUNCTIONAL DESCRIPTION OF THE RADAR COURSE DIRECTING CENTRAL

9 (U). General

The RCDC has three tactical missions (surface-to-air, surface-to-air low altitude, and surface-to-surface) and a radar bomb scoring mission. The major operational systems of the RCDC are the nike acquisition radar (NAR), the auxiliary acquisition radar (AAR) (selected NIKE-HERCULES systems), the target tracking radar (TTR), the missile tracking radar (MTR), the computer, and the tactical control systems.

10 (U). Block Diagram Analysis for Surface-to-Air Mission

a. A NIKE-HERCULES battery may be equipped with the NAR system (fig. 5) only, or with both the NAR and the AAR systems. Either system is used to detect and locate aircraft and other moving objects approaching the area defended by the battery. In operation, each acquisition radar system (NAR and AAR) transmits pulses of rf energy from a directional antenna. The antenna rotates continuously in azimuth so that 360-degree coverage is obtained. When the transmitted rf energy encounters an aircraft or other object, some of the energy is reflected to the acquisition radar system. This reflected rf energy is converted into video which is used in the scope presentations. In systems using both acquisition radar systems, a video select circuit permits selection of either NAR or AAR video for presentation.

b. Identification of objects may be made by means of an identification friend or foe (IFF) system. An IFF system is associated with each acquisition radar system. The IFF system transmits coded IFF interrogation pulses to an unidentified object. A friendly aircraft with properly coded IFF equipment responds automatically to the interrogation pulses by transmitting coded IFF response pulses. These response pulses are converted into IFF video for scope presentation. Identification of objects may also be provided by an Army Air Defense Command Post (AADCP) through the fire unit integration facility (FUIF).

c. If an object detected by the acquisition radar system is identified as hostile and designated as a target, designated target position data is supplied to the target tracking radar (TTR) system. The TTR system transmits rf energy from a directional antenna and receives the rf energy reflected from the target. The target track antenna does not rotate continuously but is, instead, directed at the designated target. The designated target position data from the acquisition radar system enables the TTR system to acquire the target quickly. The TTR system then tracks the target and supplies continuous target position data to the computer system.

d. The computer system continuously predicts an intercept point and sends gyro azimuth (A_G) preset data through the launching control station to the selected missile before launch. This A_G data is used as a reference by the missile to roll to a predetermined attitude after launch.

e. The operation of the missile tracking radar (MTR) system is similar to that of the TTR system. However, the rf energy transmitted to the missile by the MTR system consists of coded pulse groups representing guidance and burst commands. The signals received from the missile are not reflected rf energy but consist of missile response pulses automatically transmitted by the missile in response to the guidance commands. The MTR system tracks the selected missile before and after launch and supplies continuous missile position data to the computer system.

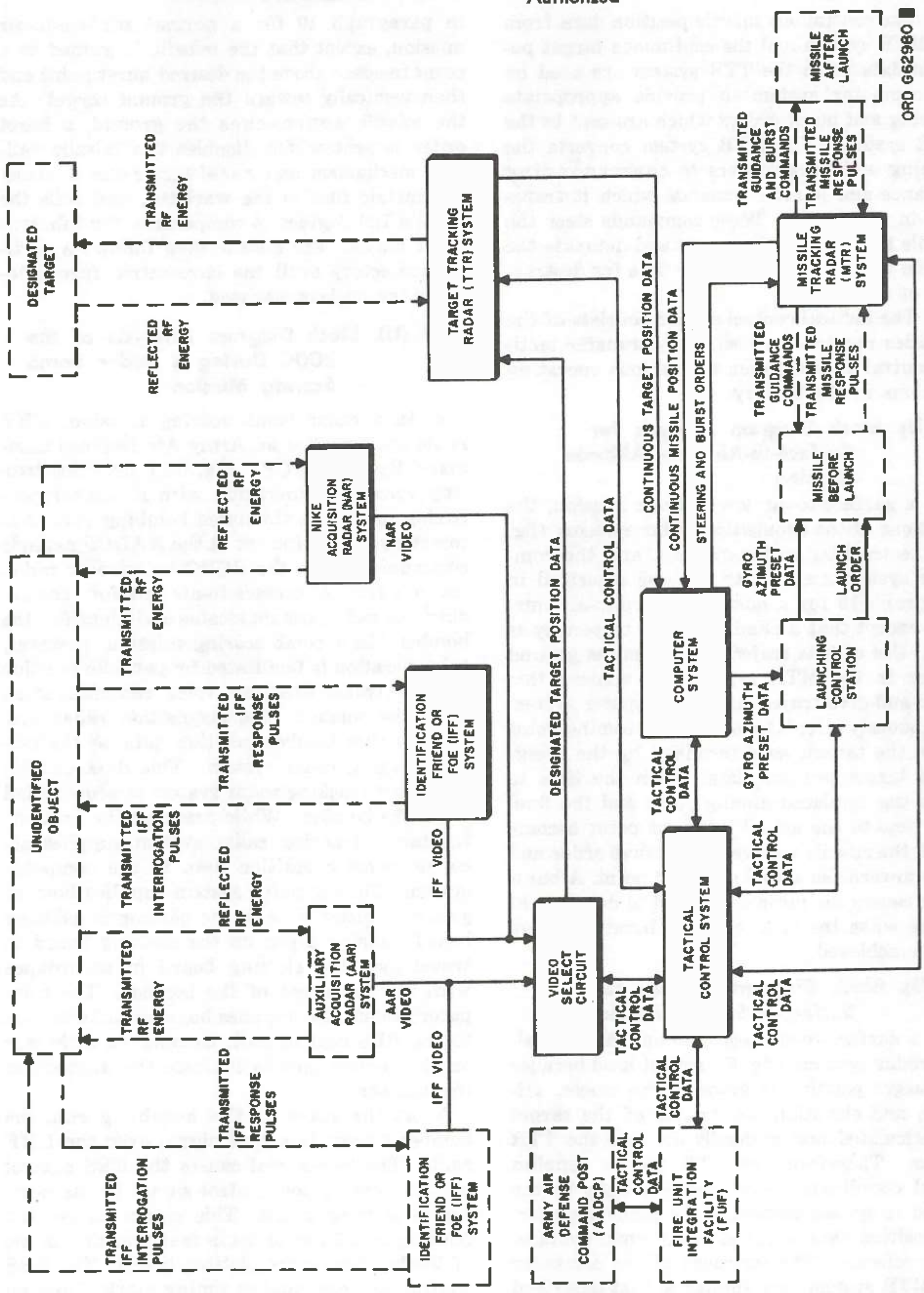

Figure 5 (U). Radar course directing central—functional block diagram.

f. The continuous missile position data from the MTR system and the continuous target position data from the TTR system are used by the computer system to provide appropriate steering and burst orders which are sent to the MTR system. The MTR system converts the steering and burst orders to corresponding guidance and burst commands which it transmits to the missile. These commands steer the missile to intercept the target and detonate the missile warhead at the proper time for destruction of the target.

g. The tactical control system consists of the facilities required to electrically transfer tactical control data between the various operating positions in the battery.

11 (U). Block Diagram Analysis for Surface-to-Air Low Altitude Mission

In a surface-to-air low altitude mission, the functions of the acquisition radar systems (fig. 5), the tracking radar systems, and the computer system are similar to those described in paragraph 10 for a normal surface-to-air mission, except that a climb-and-dive trajectory is used. Use of this trajectory minimizes ground clutter in the MTR system. To achieve this climb-and-dive trajectory, the computer system continuously calculates a displaced aiming point above the target, as determined by the designated target position data. When the time to reach the displaced aiming point and the final dive time to the actual intercept point become equal, the missile receives a final dive order and dives toward the actual intercept point. A burst order causes the missile warhead to detonate at a time when the most effective burst coverage will be achieved.

12 (U). Block Diagram Analysis for Surface-to-Surface Mission

In a surface-to-surface mission, the acquisition radar systems (fig. 5) are not used because the target position is known. The range, azimuth, and elevation coordinates of the target are calculated and manually set into the TTR system. Therefore, the TTR system supplies locked coordinate target position data to the computer system instead of the continuous target position data supplied in a normal surface-to-air mission. The functions of the computer and MTR systems are similar to that described in paragraph 10 for a normal surface-to-air mission, except that the missile is guided to a point in space above the desired burst point and then vertically toward the ground target. As the missile approaches the ground, a burst order is sent which disables the missile fail-safe mechanism and receiver, arms a preset barometric fuze in the warhead, and rolls the missile 180 degrees to compensate for inherent flight biases. The missile then follows a vertical trajectory until the barometric fuze detonates the nuclear warhead.

12.1 (U). Block Diagram Analysis of the RCDC During a Radar Bomb Scoring Mission

a. In a radar bomb scoring mission, UHF radio equipment at an Army Air Defense Command Post (AADCP) (fig. 5.1) provides two-way voice communication with a bomber preparing to make a simulated bombing run. Automatic relay equipment at the AADCP extends communication to the RCDC by wire or radio. As in a tactical surface-to-air mission, the acquisition radar system locates and identifies the bomber. In a bomb scoring mission, however, this operation is facilitated by periodic position reports transmitted by voice communication from the bomber. The acquisition radar system supplies bomber position data to the target tracking radar system. This data enables the target tracking radar system to acquire and track the bomber. While tracking the bomber, the target tracking radar system supplies accurate bomber position data to the computer system. The computer system supplies bomber ground position data to the horizontal plotting board, causing a pen on the plotting board to travel over the plotting board in accordance with the movement of the bomber. The computer system also supplies bomber altitude data to the RBS control unit, causing an altimeter on the control unit to indicate the altitude of the bomber.

b. At the start of the bombing run, the bomber transmits a tone signal over the UHF radio. The tone signal causes the RBS control unit to apply a pen control signal to the horizontal plotting board. This signal causes the plotting board pen to begin marking the course of the bomber on the plotting board. The RBS control unit also applies timing marks through

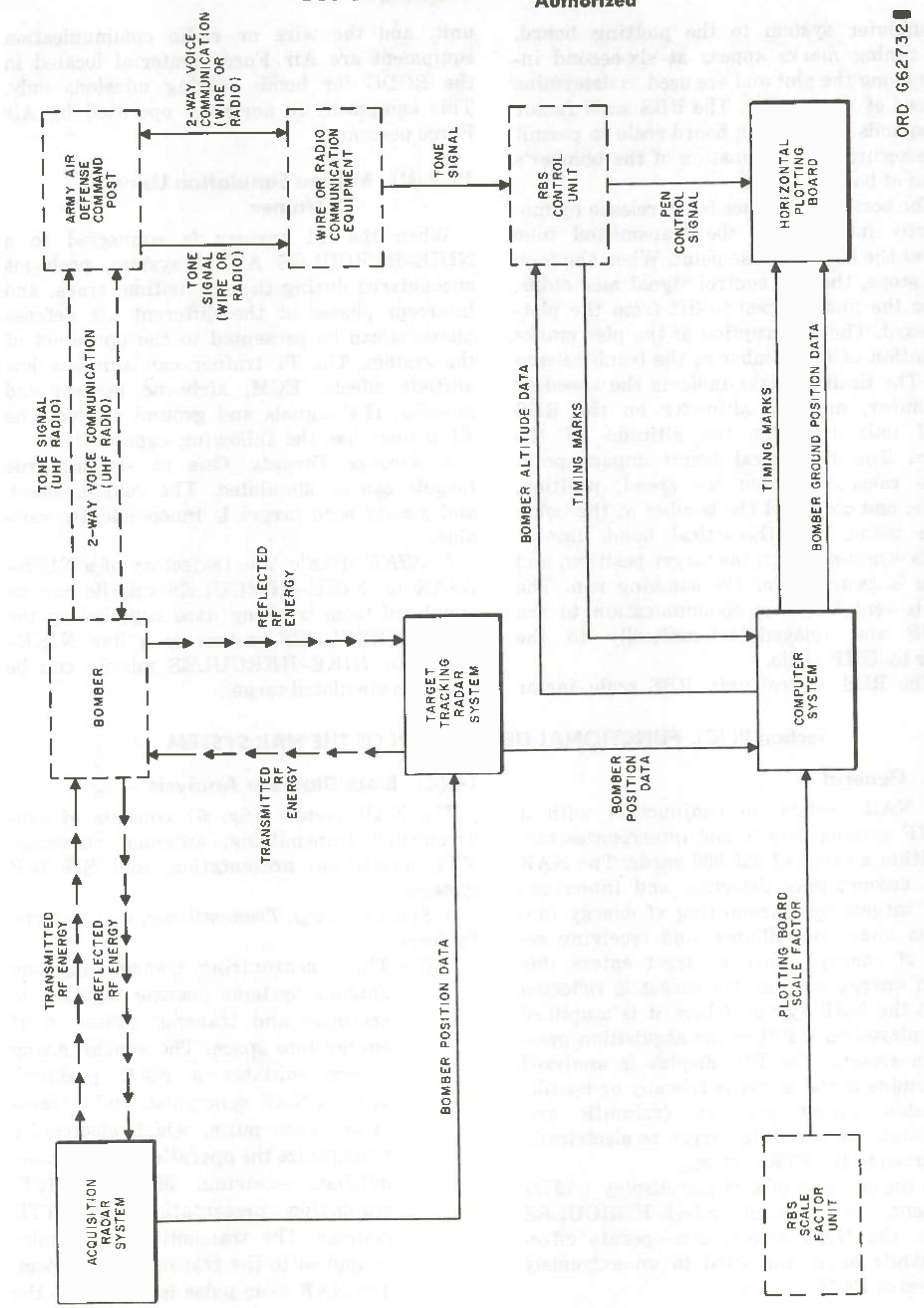

Figure 5.1 (U). Radar course directing central—radar bomb scoring mission—block diagram (U).

the computer system to the plotting board. These timing marks appear at six-second intervals along the plot and are used to determine the speed of the bomber. The RBS scale factor unit expands the plotting board scale to permit a more accurate determination of the bomber's position at bomb release.

c. The bomber simulates bomb release by momentarily interrupting the transmitted tone signal at the bomb release point. When the tone signal stops, the pen control signal also stops, causing the plotting pen to lift from the plotting board. The interruption of the plot marks the location of the bomber at the bomb release point. The timing marks indicate the speed of the bomber, and the altimeter on the RBS control unit indicates the altitude of the bomber. The theoretical bomb impact point can be calculated from the speed, position, altitude, and course of the bomber at the bomb release point. The theoretical bomb impact point is compared with the target position, and a score is assigned for the bombing run. The scope is sent by voice communication to the AADCP and relayed automatically to the bomber by UHF radio.

d. The RBS control unit, RBS scale factor unit, and the wire or radio communication equipment are Air Force material located in the RCDC for bomb scoring missions only. This equipment is normally operated by Air Force personnel.

12.2 (U). Mission Simulation Using T1 Trainer

When the T1 trainer is connected to a NIKE-HERCULES ATBM system, problems encountered during the acquisition, track, and intercept phases of the different air defense missions can be presented to the operators of the system. The T1 trainer can simulate low altitude effects, ECM, airborne targets and missiles, IFF signals and ground clutter. The T1 trainer has the following capabilities.

a. Airbone Targets. One to six airborne targets can be simulated. The course, speed, and size of each target is independently variable.

b. NIKE Missile. The trajectory of a NIKE-AJAX or NIKE-HERCULES missile can be simulated from tracking data supplied by the NIKE-HERCULES system or a live NIKE-AJAX or NIKE-HERCULES missile can be fired at a simulated target.

Section III (C). FUNCTIONAL DESCRIPTION OF THE NAR SYSTEM

13 (U). General

The NAR system, in conjunction with a SIF/IFF system, detects and interrogates targets within a range of 250,000 yards. The NAR system accomplishes detection and interrogation of targets by transmitting rf energy into the area under surveillance, and receiving reflected rf energy. When a target enters this area, rf energy striking the target is reflected back to the NAR system where it is amplified and displayed on a PPI in the acquisition presentation system. The PPI display is analyzed to determine if the target is friendly or hostile. Designated target position (azimuth and range) data of a hostile target is electrically transferred to the TTR system.

With the addition of anti-jam display (AJD) equipment, in selected NIKE-HERCULES systems, the NAR system can operate effectively while being subjected to an extremely high level of ECM activity.

14 (C). Block Diagram Analysis

The NAR system (fig. 6) consists of synchronizing, transmitting, antenna, receiving, MTI, acquisition presentation, and SIF/IFF systems.

a. Synchronizing, Transmitting, and Antenna Systems.

(1) The synchronizing, transmitting, and antenna systems operate together to originate and transmit pulses of rf energy into space. The synchronizing system initiates a NAR preknock pulse, a NAR sync pulse, and a transmitter sync pulse, which electrically synchronize the operation of the transmitting, receiving, MTI, SIF/IFF, acquisition presentation, and TTR systems. The transmitter sync pulse is applied to the transmitting system. The NAR sync pulse is applied to the

acquisition presentation system. The NAR preknock pulse is applied to the receiving, MTI, SIF/IFF, acquisition presentation, and TTR systems.

(2) The transmitter sync pulse is used to trigger the transmitting system which produces high power rf for application to the antenna system. The NAR antenna focuses the high power rf into a narrow (pencil) beam and directs this rf energy to search the area under surveillance. The antenna drive rotates the NAR antenna 360 degrees in azimuth. The reflected rf energy from

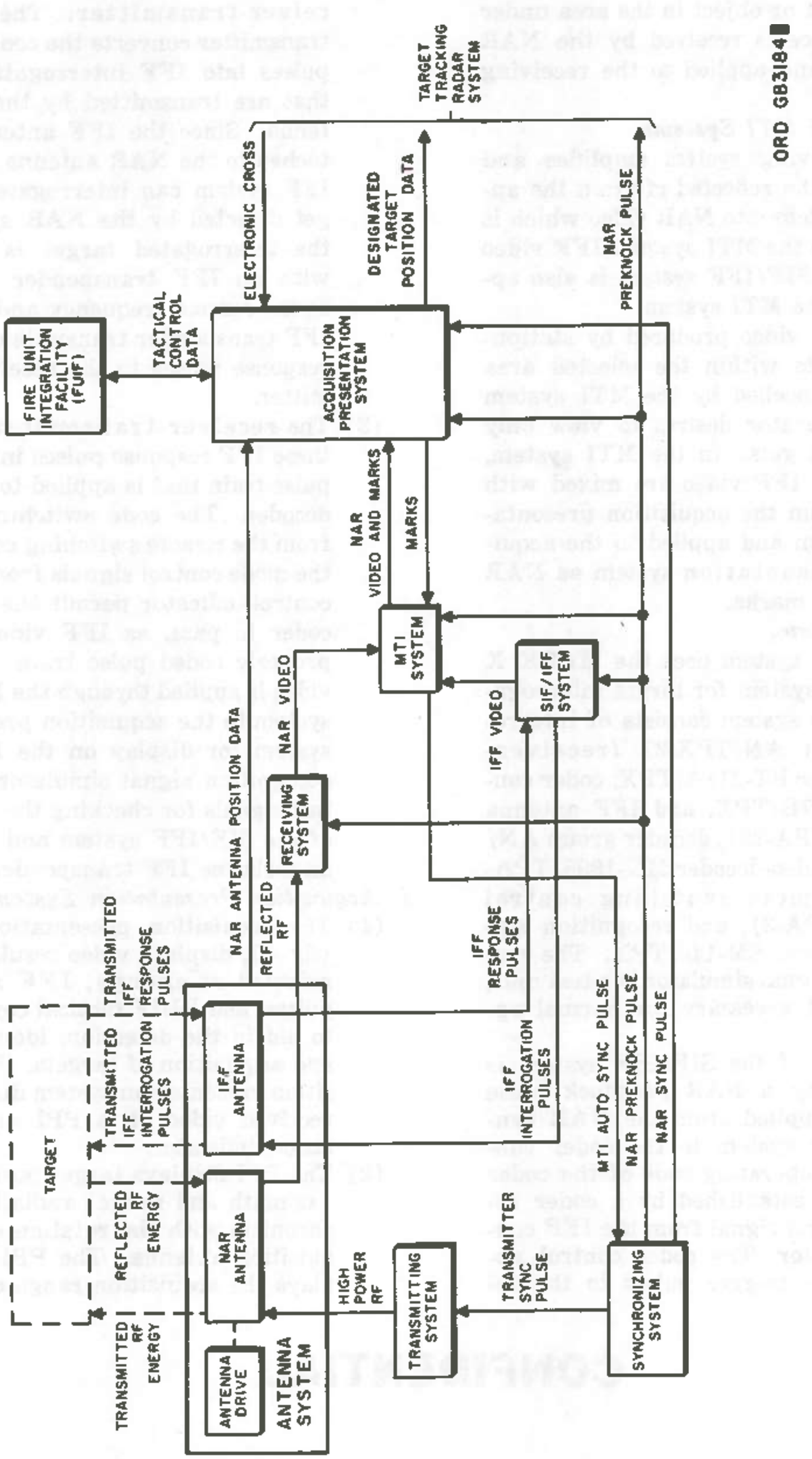

Figure 6 (U). Nike acquisition radar system—block diagram.

any target or object in the area under surveillance is received by the NAR antenna and applied to the receiving system.

b. Receiving and MTI Systems.

(1) The receiving system amplifies and converts the reflected rf from the antenna system into NAR video which is applied to the MTI system. IFF video from the SIF/IFF system is also applied to the MTI system.

(2) The NAR video produced by stationary objects within the selected area can be cancelled by the MTI system if the operator desires to view only moving targets. In the MTI system, NAR and IFF video are mixed with marks from the acquisition presentation system and applied to the acquisition presentation system as NAR video and marks.

c. SIF/IFF System.

(1) The NAR system uses the MARK X SIF/IFF system for target interrogation. This system consists of interrogator set AN/TPX-27 (receiver-transmitter RT-211A/TPX, coder control KY-97B/TPX, and IFF antenna AT-352/UPA-22), decoder group AN/TPA-3 (video-decoder MX-1995/TPA-3 and remote switching control C-1903/TPA-3), and recognition signal simulator SM-140/TPX. The recognition signal simulator is a test unit, and is not necessary for normal operation.

(2) Operation of the SIF/IFF system is initiated by a NAR preknock pulse (fig. 7) applied from the NAR synchronizing system to the coder control. The operating code of the coder control is established by a coder remote control signal from the IFF control-indicator. The coder control applies coded trigger pulses to the receiver-transmitter. The receiver-transmitter converts the coded trigger pulses into IFF interrogation pulses that are transmitted by the IFF antenna. Since the IFF antenna is attached to the NAR antenna, the SIF/IFF system can interrogate any target detected by the NAR system. If the interrogated target is equipped with an IFF transponder operating at the correct frequency and code, the IFF transponder transmits coded IFF response pulses to the receiver-transmitter.

(3) The receiver-transmitter converts these IFF response pulses into a coded pulse train that is applied to the video decoder. The code switching signals from the remote switching control and the mode control signals from the IFF control-indicator permit the video decoder to pass, as IFF video, only a properly coded pulse train. The IFF video is applied through the NAR MTI system to the acquisition presentation system for display on the PPI. The recognition signal simulator provides test signals for checking the operation of the SIF/IFF system and simulates an airborne IFF transponder.

d. Acquisition Presentation System.

(1) The acquisition presentation system (fig. 6), displays video resulting from reflected rf energy, IFF response pulses, and FUIF tactical control data to aid in the detection, identification, and acquisition of targets. The acquisition presentation system displays the received video on a PPI and a precision indicator.

(2) The PPI displays target position data (azimuth and range) radially in synchronism with the rotation of the acquisition antenna. The PPI also displays the acquisition range circle, the

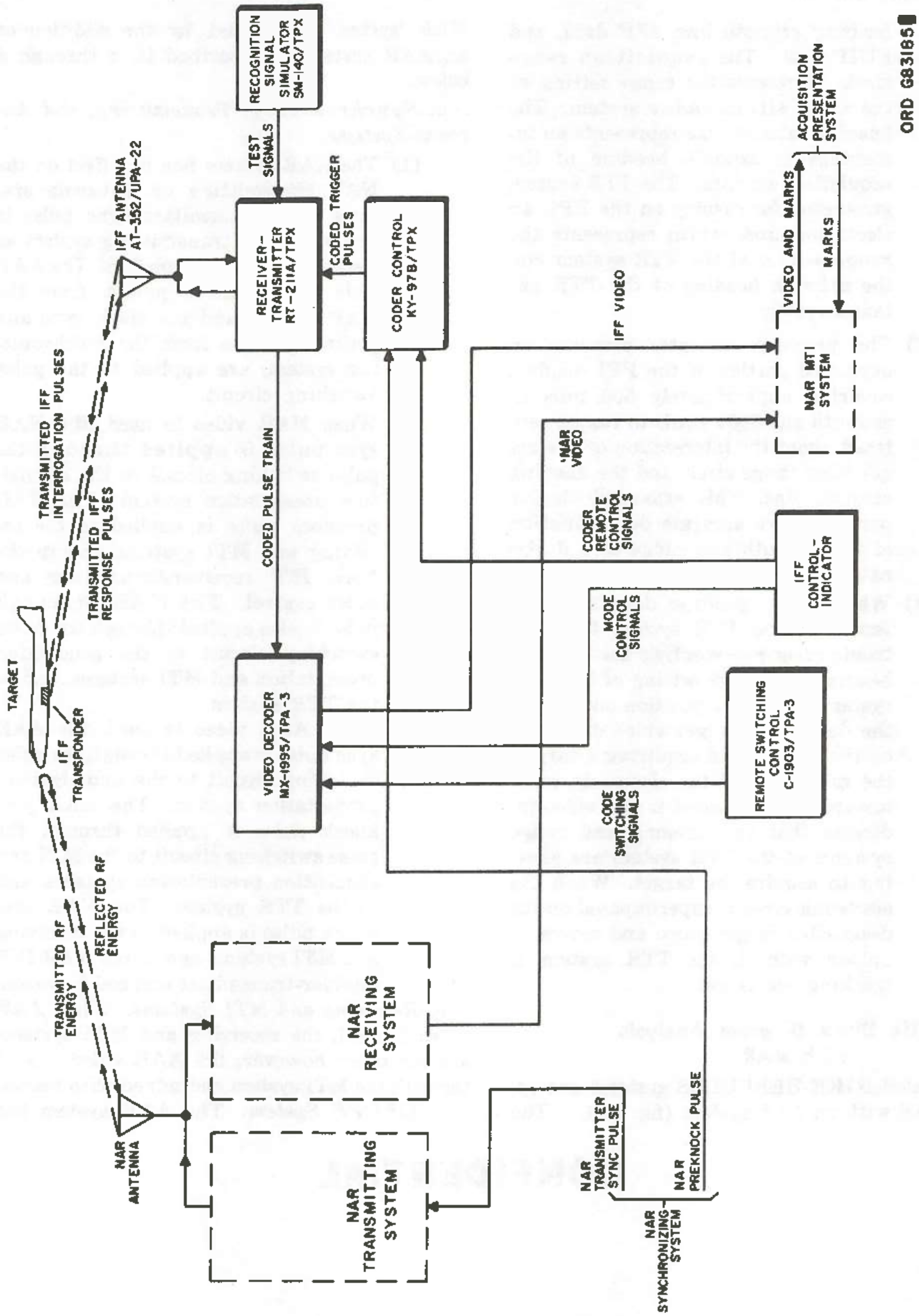

Figure 7 (U). SIF/IFF system—block diagram.

flashing azimuth line, IFF data, and FUIF data. The acquisition range circle represents the range setting of the acquisition radar system. The flashing azimuth line represents an instantaneous azimuth heading of the acquisition antenna. The TTR system generates, for display on the PPI, an electronic cross which represents the range setting of the TTR system and the azimuth heading of the TTR antenna system.

(3) The precision indicator presents an expanded portion of the PPI display, covering approximately 500 mils in azimuth and 8000 yards in range, centered about the intersection of the acquisition range circle and the flashing azimuth line. This expanded display permits more accurate determination of the azimuth and range of a designated target.

(4) When target position data is transferred to the TTR system the electronic cross representing the azimuth heading and range setting of the TTR system moves to a position on or near the designated target video displayed on the PPI. When acquiring a target, the movement of the electronic cross toward the designated target video indicates that the antenna and range systems of the TTR system are slewing to acquire the target. When the electronic cross is superimposed on the designated target video and moves in unison with it, the TTR system is tracking the target.

14.1 (U). Block Diagram Analysis with AAR

Selected NIKE-HERCULES systems are operated with an AAR system (fig. 7.1). The NAR system is effected by the addition of an AAR system as described in *a* through *d* below.

a. Synchronizing, Transmitting, and Antenna Systems.

(1) The AAR system has no effect on the NAR transmitting or antenna systems. The transmitter sync pulse is applied to the transmitting system as described in paragraph 14*a*. The AAR sync and preknock pulses, from the AAR system, and the NAR sync and preknock pulses from the synchronizing system, are applied to the pulse switching circuit.

(2) When NAR video is used, the NAR sync pulse is applied through the pulse switching circuit to the acquisition presentation system. The NAR preknock pulse is applied to the receiving and MTI systems and to the NAR IFF receiver-transmitter and coder control. The NAR preknock pulse is also applied through the pulse switching circuit to the acquisition presentation and MTI systems, and to the TTR system.

(3) When AAR video is used, the AAR sync pulse is applied through the pulse switching circuit to the acquisition presentation system. The AAR preknock pulse is applied through the pulse switching circuit to the MTI and acquisition presentation systems, and to the TTR system. The NAR preknock pulse is applied to the receiving and MTI systems and to the NAR IFF receiver-transmitter and coder control.

b. Receiving and MTI Systems. When AAR video is used, the receiving and MTI systems are not used; however, the AAR video is sent through the MTI system and mixed with marks.

c. SIF/IFF System. The AAR system has

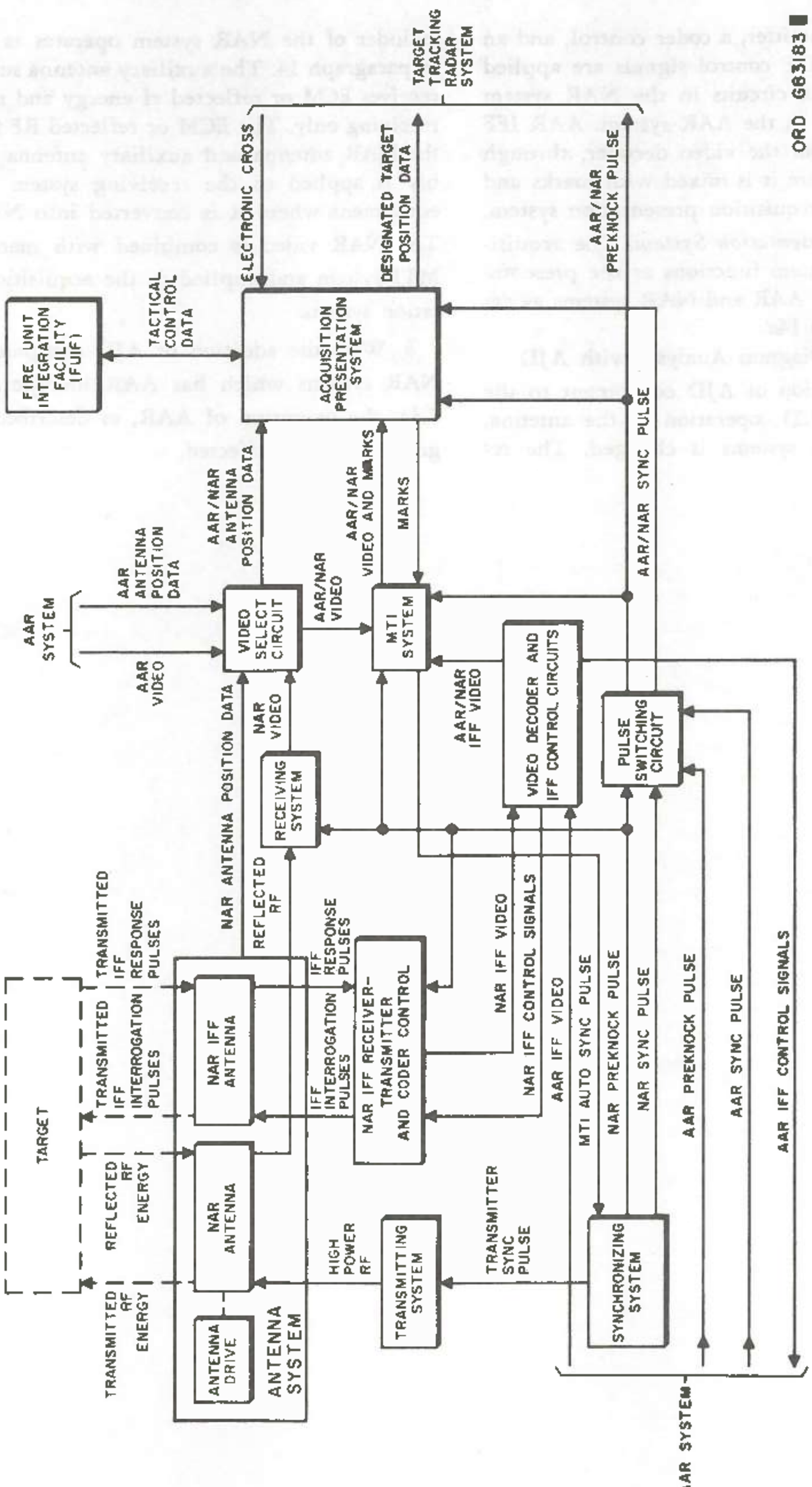

Figure 7.1 (U). Nike acquisition radar system (with AAR)—block diagram.

an IFF receiver-transmitter, a coder control, and an IFF antenna. AAR IFF control signals are applied from the IFF control circuits in the NAR system to the coder control in the AAR system. AAR IFF video is applied from the video decoder, through the MTI system where it is mixed with marks and AAR video, to the acquisition presentation system.

d. Acquisition Presentation System. The acquisition presentation system functions as the presentation system for both AAR and NAR systems as described in paragraph 14*d*.

14.2 (U). Block Diagram Analysis with AJD

a. With the addition of AJD equipment to the NAR system (fig. 7.2), operation of the antenna, receiving, and MTI systems is changed. The remainder of the NAR system operates as described in paragraph 14. The auxiliary antenna subassembly receives ECM or reflected rf energy and is used for receiving only. The ECM or reflected RF from both the NAR antenna and auxiliary antenna subassembly is applied to the receiving system and AJD equipment where it is converted into NAR video. The NAR video is combined with marks in the MTI system and applied to the acquisition presentation system.

b. With the addition of AJD equipment to the NAR systems which has AAR incorporated (fig. 7.3), the operation of AAR, as described in paragraph 14.1, is unaffected.

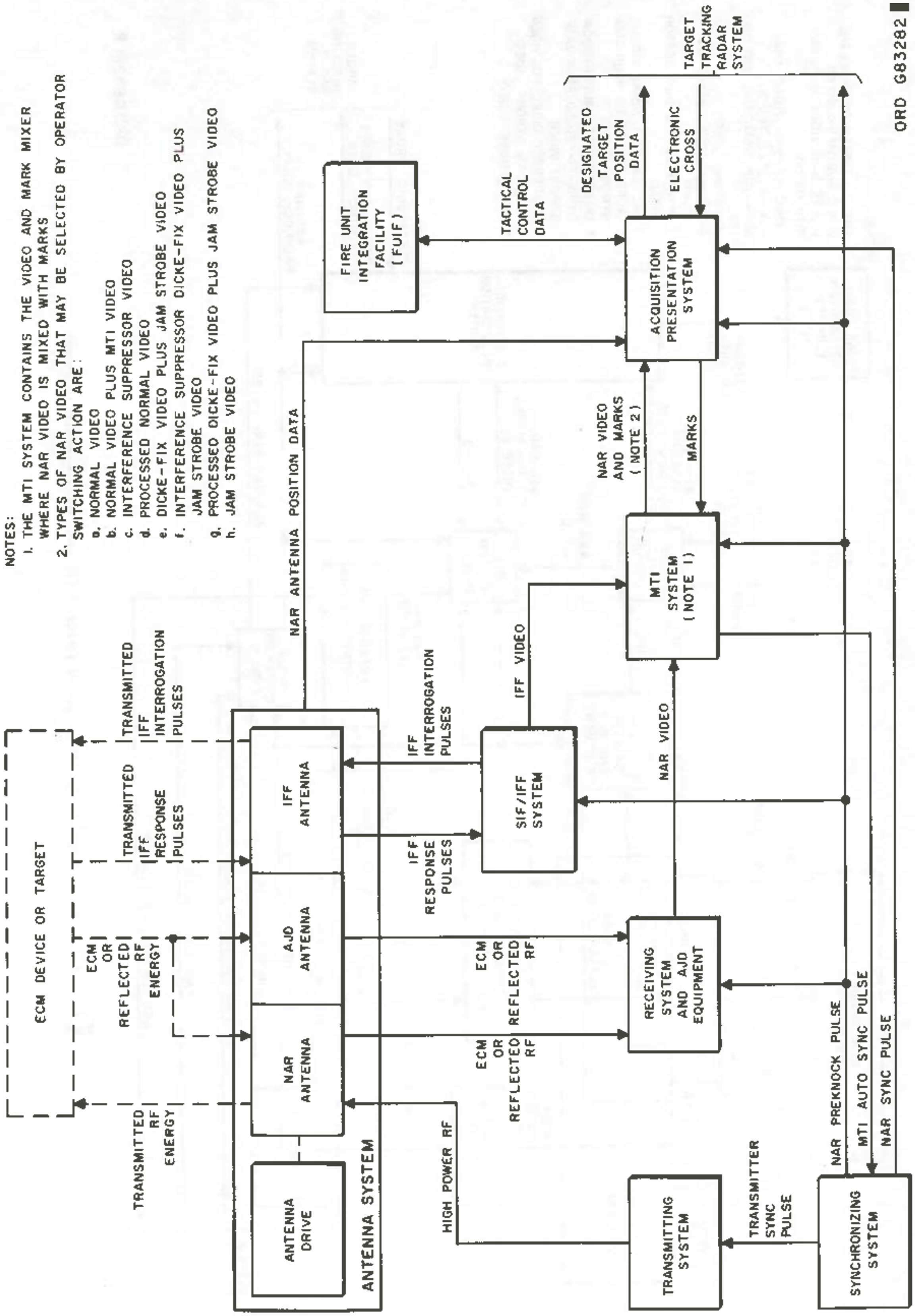

Figure 7.2 (U). Acquisition radar system (with AJD)—block diagram.

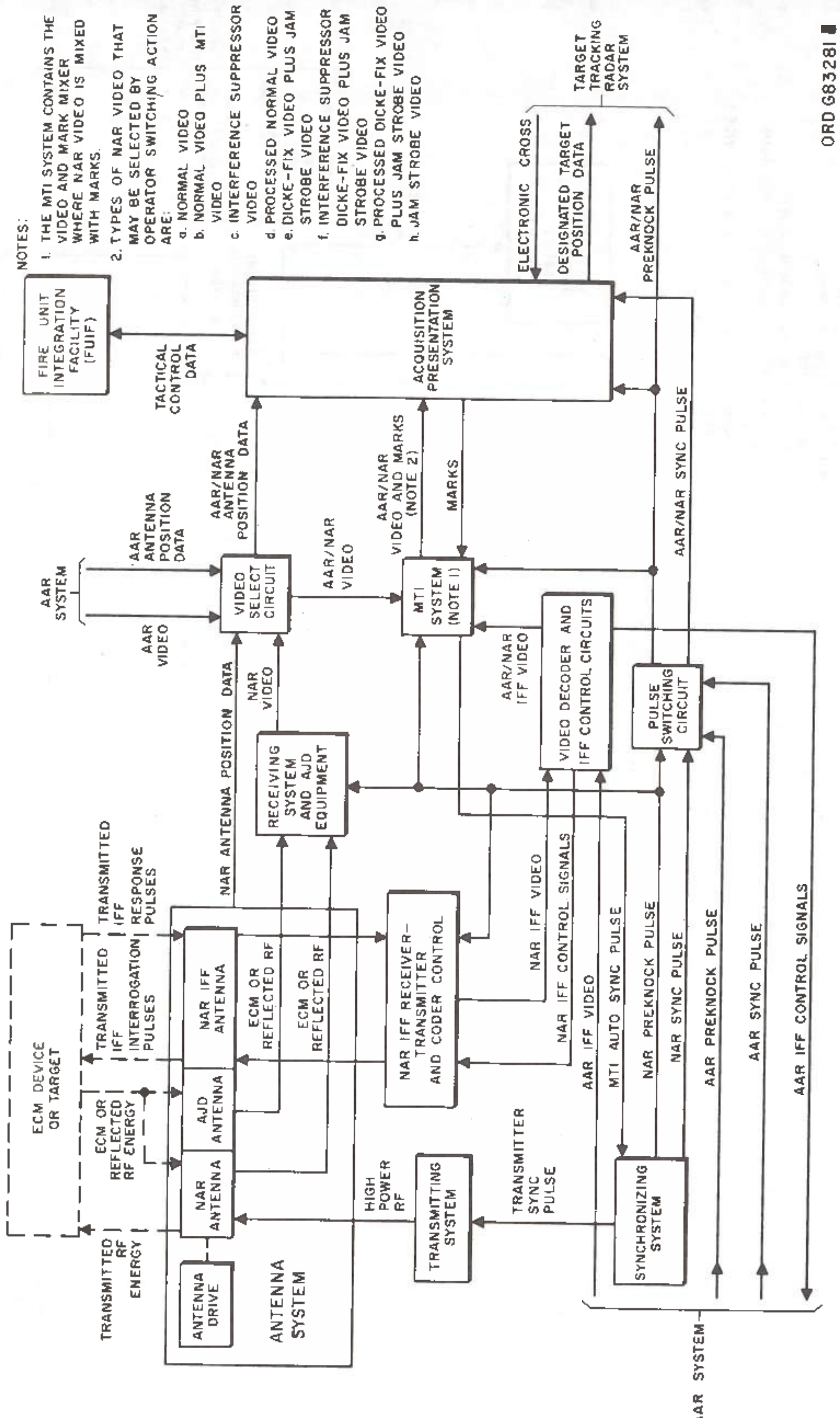

Figure 7.3 (U). Acquisition radar system (with AAR and AJD)—block diagram.

Section IV (CMHA). FUNCTIONAL DESCRIPTION OF THE FIRE UNIT INTEGRATION FACILITY

15 (CMHA). General

a. The FUIF equipment is used with missile master AN/FSG-1 or with missile monitor AN/MSG-4 to provide an integrated air defense for a particular defended area. This integrated system relays accurate and nearly instantaneous data between an Army Air Defense Command Post (AADCP) and related NIKE-HERCULES systems.

b. The FUIF equipment consists of the equipment in the battery control area at a NIKE-HERCULES site which connects the NIKE-HERCULES system to the missile master or missile monitor. The FUIF equipment functions as the interconnecting link between the NIKE-HERCULES system and the AADCP.

c. The AADCP has as its primary function the detection, identification, and tracking of targets within its area of responsibility; the storage, evaluation, and distribution of target information to the systems connected to it, and the overall monitoring and supervising of the integrated system-to-target engagement status.

16 (CMHA). Block Diagram Analysis

a. The FUIF equipment at the NIKE-HERCULES system consists of equipment in the FUIF portion of the electronic shop building at a permanent site, or in the FUIF truck at a semi-mobile site.

b. The FUIF equipment accepts signals originating at the AADCP (fig. 8). There are three types of signals: target position coordinate data, target identification data, and tactical control data. The target position coordinate data is decoded, parallax-corrected, and pro-

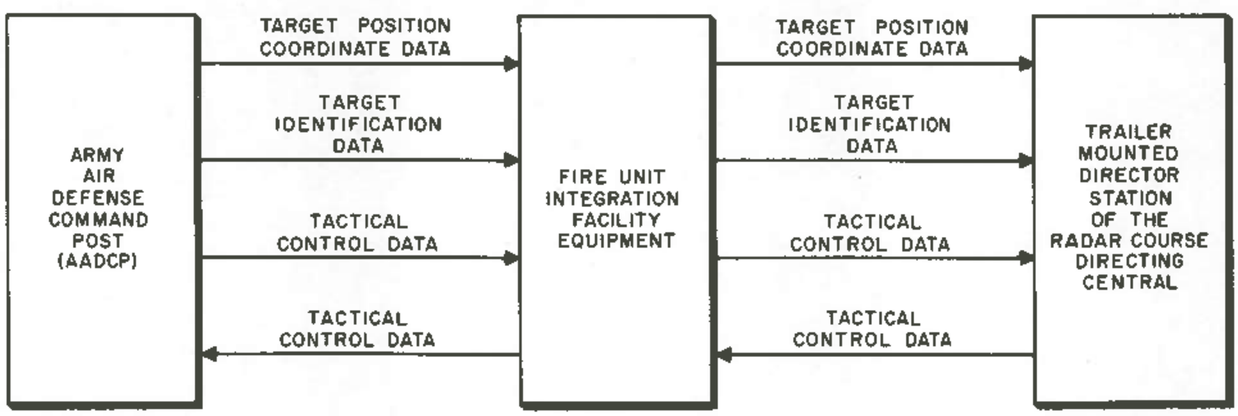

Figure 8 (U). Fire unit integration facility—block diagram.

cessed within the FUIF equipment and applied to the acquisition presentation system. The target position coordinate data is parallax-corrected to compensate for the difference in location between the AADCP and the RCDC. The target identification data is decoded and processed in the FUIF equipment and applied to the acquisition presentation system. The target position coordinate data and the target identification data cause a target identification symbol to appear on the PPI. For a detailed discussion of FUIF presentation and control, refer to paragraphs 84 and 85.

c. The tactical control data is also decoded by the FUIF equipment. This decoded data is applied to the tactical control system in the trailer mounted director station, causing indicator lights on the battery signal panel-indicator of the battery control console (fig. 24) to illuminate or extinguish, signifying the tactical commands from the AADCP.

d. Similar tactical control data is originated in the trailer mounted director station and applied to the FUIF equipment. This data is coded, processed, and transmitted to the AADCP.

e. The tactical control data in (1) through (4) below is transmitted by wire from the AADCP to the FUIF equipment at the NIKE-HERCULES system and then transmitted by cable to the trailer mounted director station.

(1) A remote signal illuminates an indicator light indicating that a target is being assigned from the AADCP to the NIKE-HERCULES system.

(2) A missile-select signal illuminates an indicator light indicating the type of missile designated by the AADCP to be used by the NIKE-HERCULES system for the current engagement.

(3) A hold-fire signal illuminates an indicator light and sounds a buzzer instructing the NIKE-HERCULES system not to fire designated missile until signaled to do so and to continue tracking the present target.

(4) A cease-fire signal illuminates an indicator light and sounds a buzzer instructing the NIKE-HERCULES system to terminate the present engagement.

f. The tactical control data in (1) through (13) below is transmitted by cable from the trailer mounted director station to the FUIF equipment at the NIKE-HERCULES system and then transmitted by wire to the AADCP.

(1) A target-designated signal or a target-abandon signal.

(2) A target-tracked signal.

(3) A fire signal.

(4) An acknowledge signal indicating that a command has been received from the AADCP and is acknowledged.

(5) An out-of-action signal indicating that the NIKE-HERCULES system is incapable of normal action.

(6) A local signal indicating that the NIKE-HERCULES system has returned to an action condition from an out-of-action condition.

(7) A validity signal requesting the AADCP to verify the designation of the target.

(8) A one signal indicating that the designated target consists of one aircraft.

(9) A few signal indicating that the designated target consists of two to five aircraft.

(10) A many signal indicating that the designated target consists of more than five aircraft.

(11) An effective signal indicating that the engagement was successful.

(12) An ineffective signal indicating that the engagement was not successful.

(13) A kill signal indicating that the mission was successful.

Section V (U). FUNCTIONAL DESCRIPTION OF THE TARGET TRACKING, AND MISSILE TRACKING RADAR SYSTEMS, AND THE RADAR TEST SET GROUP

17 (U). General

a. The major function of the TTR system is to supply continuous target position data to the computer system. The TTR system normally acquires the designated target in azimuth and range from azimuth and range data supplied by the NAR system. The target tracking radar operator searches in elevation to acquire and track the designated target. Target position data in terms of range, azimuth, and elevation is continuously supplied to the computer system until the engagement is completed.

b. The MTR system supplies continuous missile position data to the computer system, and transmits guidance and burst commands to the missile. The MTR system tracks the designated missile before launch. After launch the MTR system supplies missile range, azimuth, and elevation data to the computer system, which in turn supplies steering orders to the MTR system for transmission to the missile as guidance commands. The MTR system automatically tracks the missile by receiving rf response pulses transmitted by the missile.

c. The MTR system and the TTR system function similarly. The MTR system utilizes a dual-purpose command system instead of the synchronizing system used in the TTR system. Each radar system contains synchronizing or command, transmitting, receiving, antenna, antenna positioning, range, and presentation system.

d. The radar test set group is test equipment used for adjustment and alinement of the TTR and MTR systems.

18 (U). Block Diagram Analysis of the Target Tracking Radar System

Note. This analysis does not apply when the NIKE-HERCULES system is used in the surface-to-surface mode of operation. In the surface-to-surface mode of operation the TTR system is manually set to the target coordinates and remains so positioned for the duration of the engagement.

a. Within the TTR system (fig. 9), the AAR/NAR preknock pulse from the pulse switching circuit is applied to the synchronizing system. The synchronizing system has as outputs the TTR preknock pulse and the sync pulse. The TTR preknock pulse, coincident with the AAR/NAR preknock pulse, is applied to the range system. The sync pulse triggers the transmitting system which applies high power rf energy to the antenna system.

b. The antenna system directs the transmitted rf energy to the designated target and receives the reflected rf energy. The transmitted rf energy is concentrated into a highly directional beam by the antenna system. A portion of this transmitted rf energy is reflected from the designated target, to the antenna system. The reflected rf energy is applied from the antenna system to the receiving system. The antenna positioning system positions the antenna to the azimuth and elevation angles of the target.

c. The receiving system converts the reflected rf energy into range video for the range system and azimuth and elevation error video for the presentation system. The receiving system also furnishes azimuth and elevation angle error signals to the antenna positioning system.

d. The range system is triggered by the TTR preknock pulse from the synchronizing system. The range system supplies range data to the computer system, and range video to the presentation system. The range system also generates and supplies the range coordinate of the electronic cross to the acquisition presentation system. Designated target position data from the acquisition presentation system is applied to the range system for use when acquiring a target.

e. The azimuth and elevation angle error signals are applied from the receiving system to the antenna positioning system, driving the antenna system to continuously track the target. The antenna positioning system supplies target azimuth and elevation data to the computer system and supplies the azimuth coordinate of the electronic cross to the acquisition presentation system. Designated target position data from the acquisition presentation system is applied to the antenna positioning system for use when acquiring a target.

f. The presentation system receives azimuth and elevation error video from the receiving

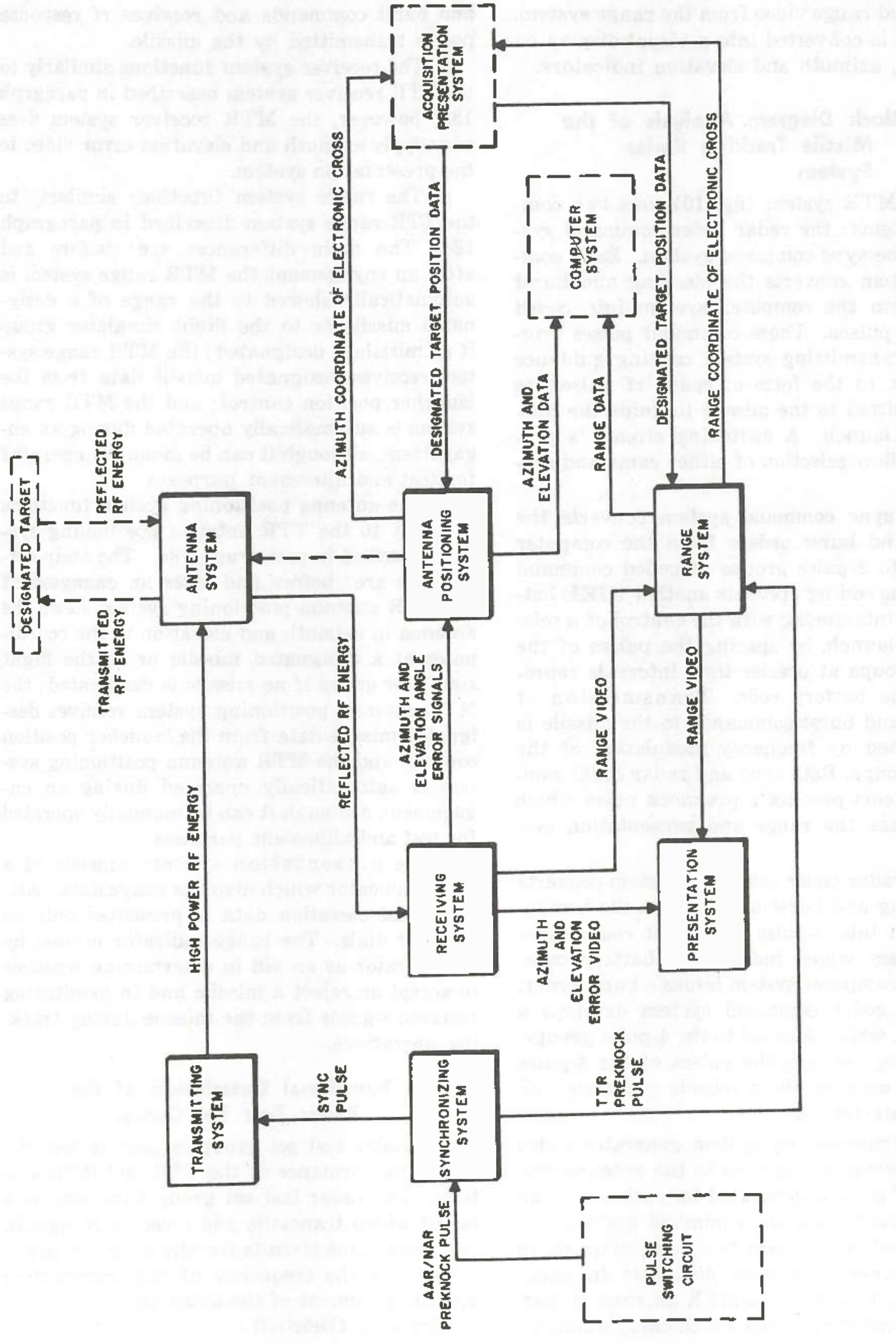

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Figure 9 (U). Target tracking radar system—block diagram.

system, and range video from the range system. The video is converted into a visual display on the range, azimuth and elevation indicators.

19 (U). Block Diagram Analysis of the Missile Tracking Radar System

a. The MTR system (fig. 10) uses two command systems: the radar coder command system and the sync command system. Each command system converts the steering and burst orders from the computer system into coded command pulses. These command pulses trigger the transmitting system causing guidance commands, in the form of coded rf pulses, to be transmitted to the missile to guide the missile after launch. A switching circuit is provided to allow selection of either command system.

b. The sync command system converts the steering and burst orders from the computer system into 2-pulse groups of coded command pulses. The coding prevents another NIKE battery from interfering with the control of a missile after launch, by spacing the pulses of the 2-pulse groups at precise time intervals representing the battery code. Transmission of guidance and burst commands to the missile is accomplished by frequency modulation of the 2-pulse groups. Both sync and radar coder command systems produce a preknock pulse which synchronizes the range and presentation systems.

c. The radar coder command system converts the steering and burst orders from the computer system into 4-pulse groups of coded command pulses which include the battery code. When the computer system issues a burst order, the radar coder command system develops a fifth pulse, which is added to the 4-pulse groups. The spacing between the pulses of the 4-pulse groups is used to effect missile guidance and prevent interference.

d. The transmitting system generates coded rf pulses which are applied to the antenna system. An rf pulse is generated for each command pulse received from the command systems.

e. The antenna system functions similarly to the TTR antenna system described in paragraph 18*b*; however, the MTR antenna system transmits coded rf pulses which carry guidance and burst commands and receives rf response pulses transmitted by the missile.

f. The receiver system functions similarly to the TTR receiver system described in paragrph 18*c*; however, the MTR receiver system does not supply azimuth and elevation error video to the presentation system.

g. The range system functions similarly to the TTR range system described in paragraph 18*d*. The main differences are: before and after an engagement the MTR range system is automatically slewed to the range of a designated missile or to the flight simulator group if no missile is designated; the MTR range system receives designated missile data from the launcher position control; and the MTR range system is automatically operated during an engagement, although it can be manually operated for test and alinement purposes.

h. The antenna positioning system functions similarly to the TTR antenna positioning system described in paragraph 18*e*. The main differences are: before and after an engagement the MTR antenna positioning system slews the antenna in azimuth and elevation to the coordinates of a designated missile or to the flight simulator group if no missile is designated; the MTR antenna positioning system receives designated missile data from the launcher position control; and the MTR antenna positioning system is automatically operated during an engagement, although it can be manually operated for test and alinement purposes.

i. The presentation system consists of a range indicator which displays range data. Azimuth and elevation data is presented only on repeater dials. The range indicator is used by the operator as an aid in determining whether to accept or reject a missile and in monitoring received signals from the missile during tracking operations.

20 (U). Functional Description of the Radar Test Set Group

The radar test set group is used to test the overall performance of the TTR and MTR systems. The radar test set group functions as a target which transmits and receives rf signals. It also contains circuits for checking the power output and the frequency of the transmitters and the alinement of the antennas.

Figure 11 (Deleted).

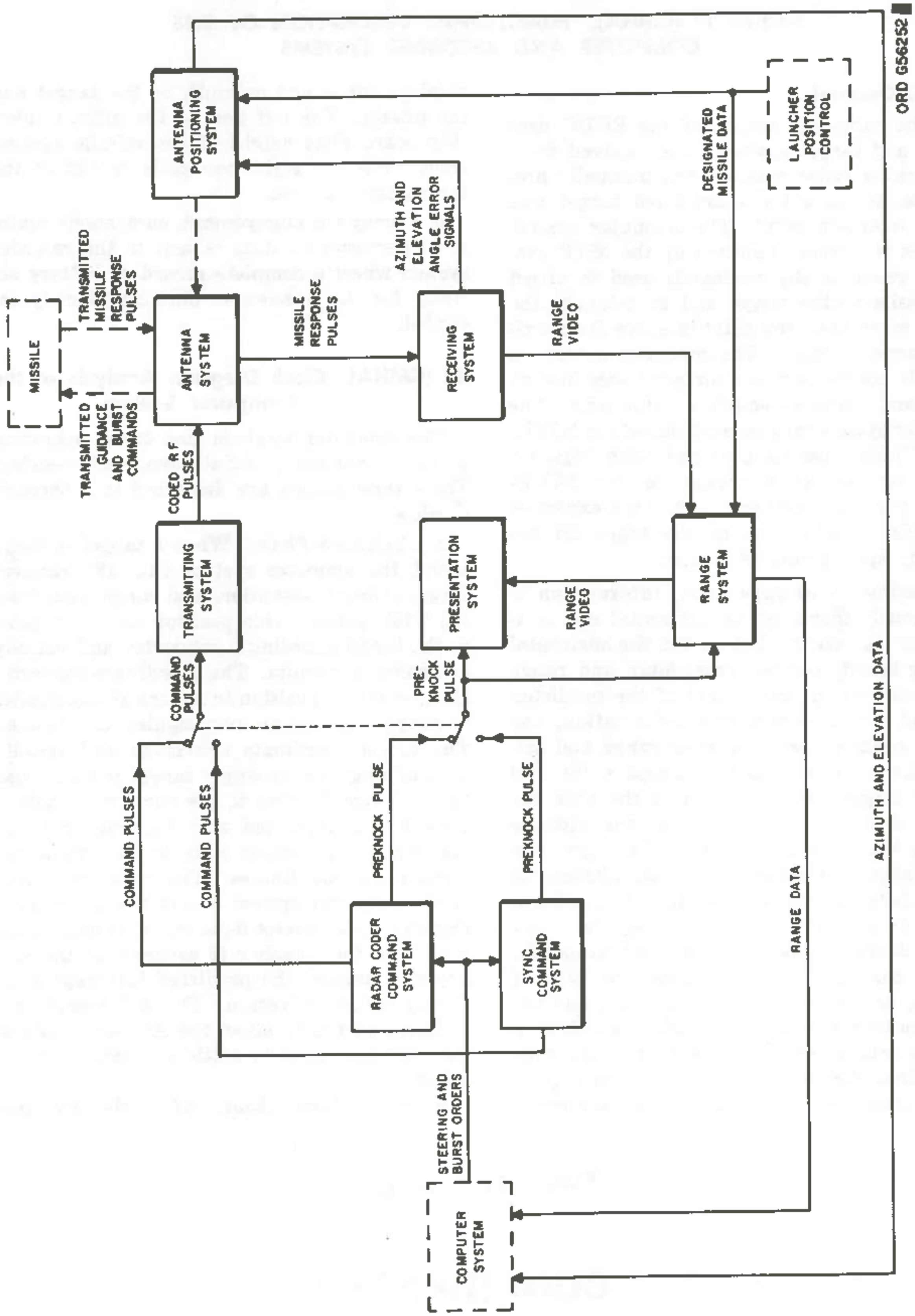


Figure 10 (U). Missile tracking radar system—block diagram.

Section VI (CMHA). FUNCTIONAL DESCRIPTION OF THE COMPUTER AND RECORDER SYSTEMS

21 (U). General

a. The computer system of the RCDC uses missile and target position data received from the tracking radar systems, and manually preset data, to solve for a predicted target and missile intercept point. The computer system provides the orders required by the MTR system to generate the commands used to direct the missile to the target and to detonate the missile at an optimum point in space for maximum target damage. The computer system is normally conditioned for surface-to-air low altitude and surface-to-surface missions. The computer system may be conditioned for NIKE-HERCULES missiles equipped with high-explosive or nuclear warheads, or for NIKE-AJAX missiles equipped with high-explosive warheads. Mission and missile types are selected by appropriate switching.

b. During an engagement, information is continuously displayed on horizontal and altitude plotting boards. Before fire, the horizontal plotting board receives the azimuth and range coordinates of the target and of the predicted intercept point. From this information, the battery control officer evaluates range and azimuth for both predicted intercept point and present target position. Prior to the time the missile is fired, the left pen of the altitude plotting board plots only time. The right pen of the altitude ploting board plots altitude of the predicted intercept point against predicted missile flight time. After evaluating the information displayed and the tactical situation, the battery control officer determines the type of mission, type of missile and warhead, and the optimum time to fire. The plotting boards continue to follow the engagement after the missile is fired, displaying target and missile position information. The horizontal plotting board displays range and azimuth of the target and the missile. The left pen of the altitude plotting board plots height of the missile against time, while the right pen plots height of the target against time.

c. During the engagement, continuous equipment performance data is sent to the recorder system where a complete record of battery activity for the mission is photographically recorded.

22 (CMHA). Block Diagram Analysis of the Computer System

The computer system has three operating phases: prelaunch, initial turn, and steering. These three phases are described in *a* through *c* below.

a. Prelaunch Phase. When a target is designated, the computer system (fig. 12) receives target azimuth, elevation, and range data from the TTR system. This position data is applied to the target coordinate converter and velocity determining circuits. The coordinate converter changes target position in spherical coordinates to target position in rectangular coordinates. The target coordinate converter and velocity determining circuits apply target present position and velocity data to the burst point solver. This data is combined with launcher parallax and burst point offset data to determine the burst point coordinates. The primary output of the computer system before fire is the gyro azimuth (AG) preset data which is sent to the missile on the launcher to assure that the missile rolls toward the predicted intercept point during roll stabilization. The AG preset data is frozen at fire to allow the AG servo loop at the launching area to settle out before missile launch.

b. Initial Turn Phase. After the fire com-

Figure 11. Deleted.

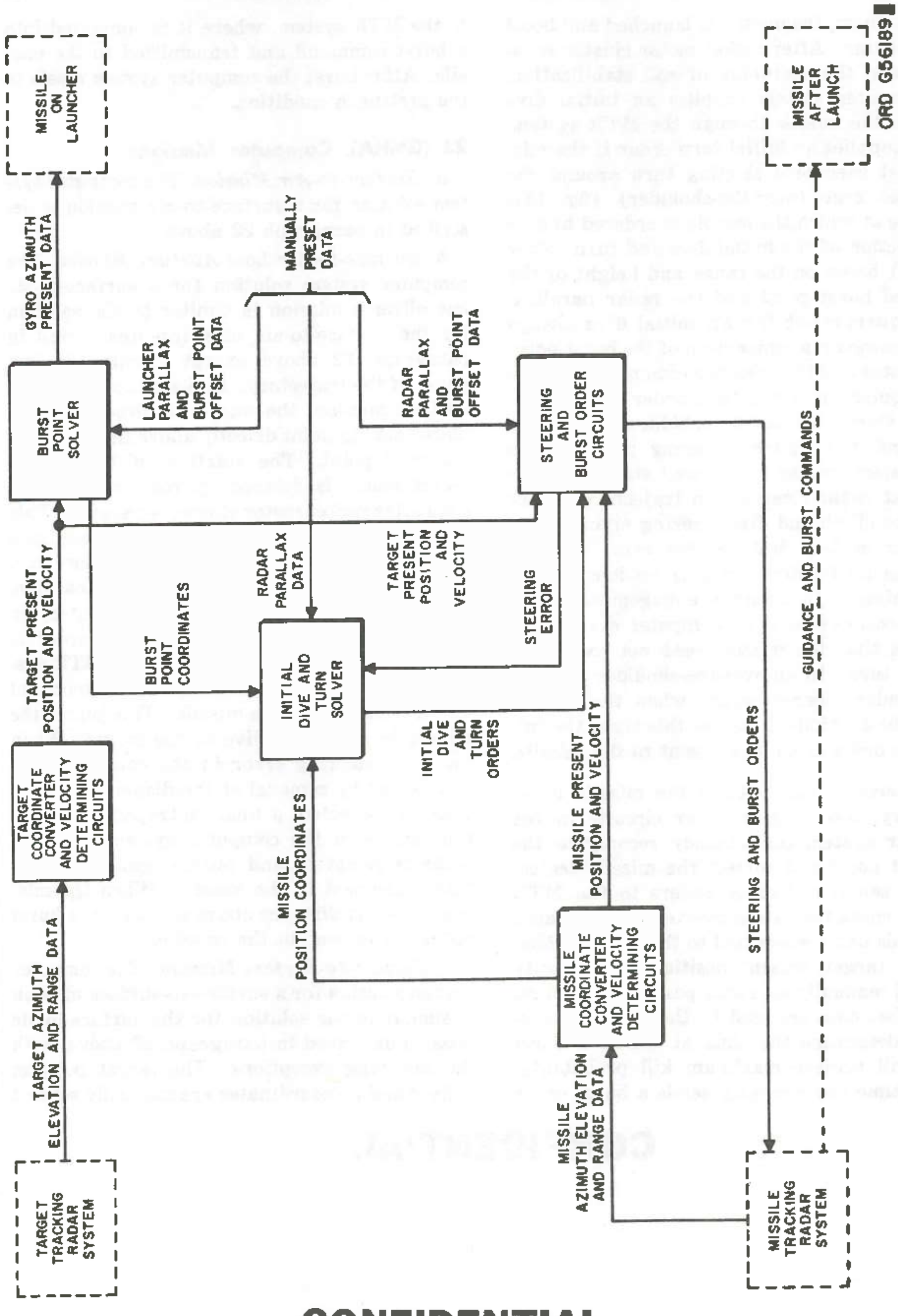


Figure 12 (U). Computer system—block diagram.

mand is given, the missile is launched and boost phase begins. After rocket motor cluster separation and the beginning of roll stabilization, the computer system supplies an initial dive order to the missile through the MTR system. It also supplies an initial turn order if the missile must execute a skirting turn around the forbidden zone (over-the-shoulder) (fig. 13). The rate at which the missile is ordered to dive is a function of the initial dive and turn solver (fig. 12) based on the range and height of the predicted burst point and the radar parallax. The requirement for an initial dive always exists; however, a comparison of the burst point coordinates and the missile position coordinates may require an initial turn order so that the missile skirts the MTR forbidden zone. The climb and dive (pitch) steering phase begins at on trajectory; the turn (yaw) steering phase begins at radar cleared. On trajectory occurs when the climb and dive steering error in the computer system first reaches zero. At this time, the initial dive order is no longer sent to the missile. In a normal engagement, radar cleared occurs when the computer system determines that the missile need not execute a skirting turn. In an over-the-shoulder engagement, radar cleared occurs when the missile passes the forbidden zone; at this time, the initial turn order is no longer sent to the missile.

c. Steering Phase. After the missile is on trajectory, the steering order circuits in the computer system continuously recompute the intercept point and correct the missile trajectory by sending steering orders to the MTR system, where they are converted into guidance commands and transmitted to the missile. Missile and target present position and velocity data and manually set radar parallax and burst point offset data are used by the computer system to determine the time at which a burst order will achieve maximum kill probability. At this time the computer sends a burst order to the MTR system, where it is converted into a burst command and transmitted to the missile. After burst the computer system resets to the prelaunch condition.

23 (CMHA). Computer Missions

a. Surface-to-Air Mission. The computer system solution for a surface-to-air mission is described in paragraph 22 above.

b. Surface-to-Air Low Altitude Mission. The computer system solution for a surface-to-air low altitude mission is similar to the solution for the surface-to-air mission described in paragraph 22 above except during the last phase of the trajectory. In a surface-to-air low altitude mission, the missile is fired at a displaced aiming point directly above the predicted intercept point. The starting of the missile rocket motor is delayed approximately 6 seconds after rocket motor cluster separation. This allows a tighter turning radius for the missile and permits intercept of relatively close targets. When time-to-intercept equals final dive time, the actual burst point is substituted for the displaced aiming point. A dive order is sent, by the computer system, to the MTR system, where it is converted into a dive command and transmitted to the missile. This places the missile in a vertical dive to the target. When the large steering error in the computer system caused by removal of the displaced aiming point is corrected, a final on-trajectory condition occurs in the computer system, the dive order is removed, and normal guidance commands are sent to the missile. When the missile is a short distance above the target, a burst command is sent to the missile.

c. Surface-to-Surface Mission. The computer system solution for a surface-to-surface mission is similar to the solution for the surface-to-air mission described in paragraph 22 above, with the following exceptions. The target position is fixed and its coordinates are manually set and

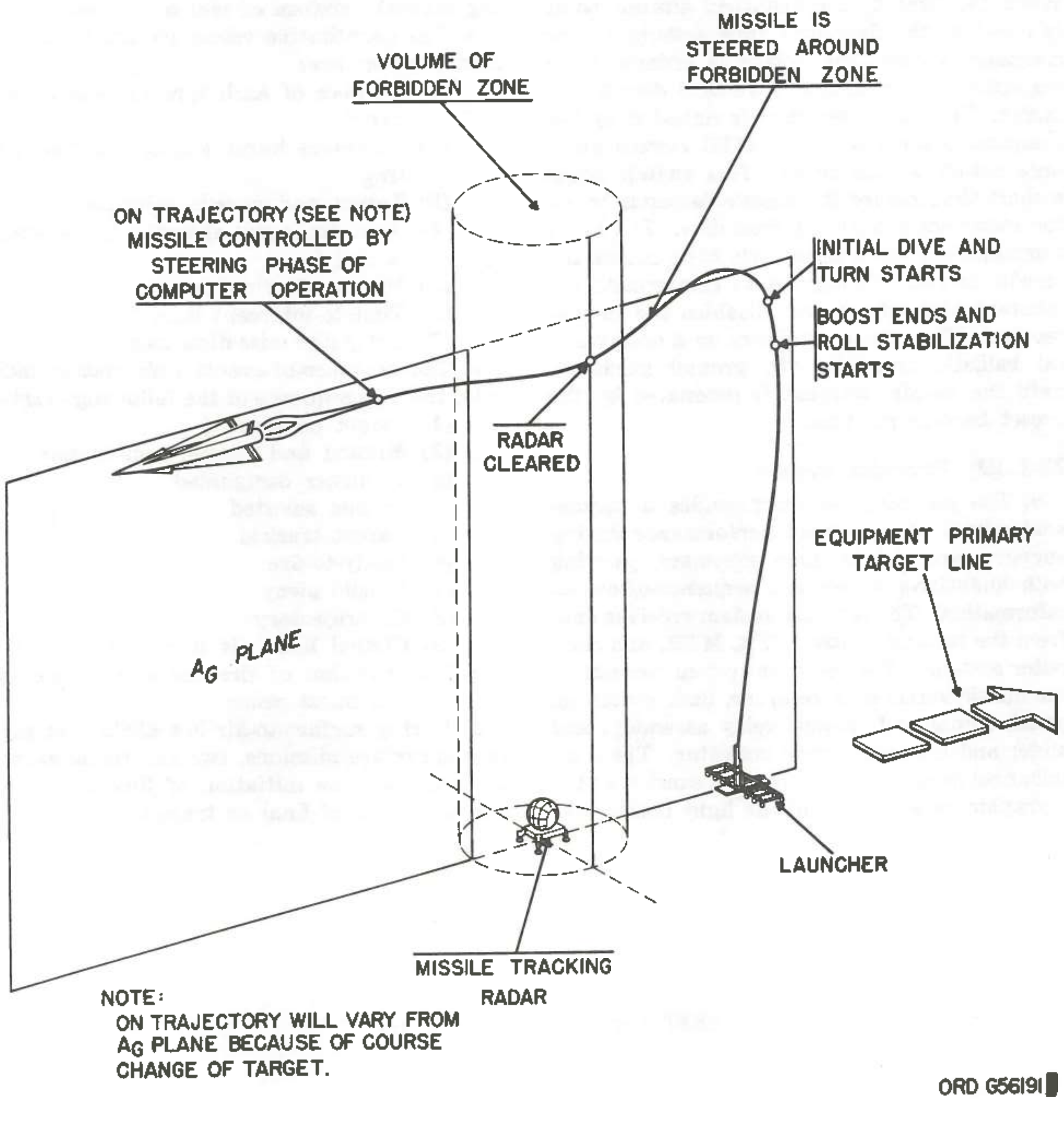


Figure 13 (U). Missile trajectory during initial turn (over-the-shoulder) phase of computer operation.

locked into the TTR system for use in the computer system. A displaced aiming point is used as in the surface-to-air low altitude mission. When the time to the displaced aiming point is equal to the final dive time setting in the computer system, the missile is ordered on a trajectory that results in a vertical dive to the target. The burst command is initiated by the computer system when the MTR system guidance cut-off switch closes. This switch closes a short time before the missile descends below the radar horizon during final dive. The burst command enables a barometric fuze, causes the missile to roll 180 degrees to compensate for inherent bias effects, and disables the missile receiver. The missile continues on a near vertical ballistic free-fall with ground guidance, until the missile warhead is detonated by the preset barometric fuze.

23.1 (U). Recorder System

a. The recorder system provides a permanent record of equipment performance during engagements and training exercises, plotting both quantitive values and sequence-of-events information. The recorder system receives data from the tactical control, TTR, MTR, and computer systems. The recorder system consists of the multichannel data recorder, data switching panel, signal and channel relay assembly, and meter and channel control-indicator. The multichannel data recorder uses light-sensitive photographic paper to record the light traces that are reflected from galvanometer mirrors and focused through an optical system. The multichannel data recorder has twenty-four recording channels, sixteen of which are used.

b. The quantitative values plotted by the recorder system are:

(1) Number of each type of missile prepared
(2) Minimum burst altitude control setting
(3) Target and missile velocities
(4) Receiver signal strength in the track radars
(5) Missile steering orders
(6) Time-to-intercept data
(7) Computed miss distances

c. The sequence-of-events information indicates the time sequence of the following events:

(1) Target designated
(2) Mission and missile combination
(3) Launcher designated
(4) Section selected
(5) Target tracked
(6) Ready-to-fire
(7) Missile away
(8) On trajectory
(9) Gimbal limit (if it occurs)
(10) Initiation of fire order, time marks, and burst order

d. During surface-to-air low altitude or surface-to-surface missions, two additional events are recorded, the initiation of final dive, and the occurrence of final on trajectory.

NEXT NUMBERED PAGE IS 39.

CHAPTER 3

PHYSICAL DESCRIPTION AND DATA OF MAJOR COMPONENTS OF THE RADAR COURSE DIRECTING CENTRAL

Section I. OVERALL PHYSICAL DESCRIPTION OF THE RADAR COURSE DIRECTING CENTRAL

24. General

The overall physical description of the radar course directing central varies depending upon whether the equipment is used in a permanent or semimobile installation. The description in this section gives location and physical information for each major component used in both types of installations.

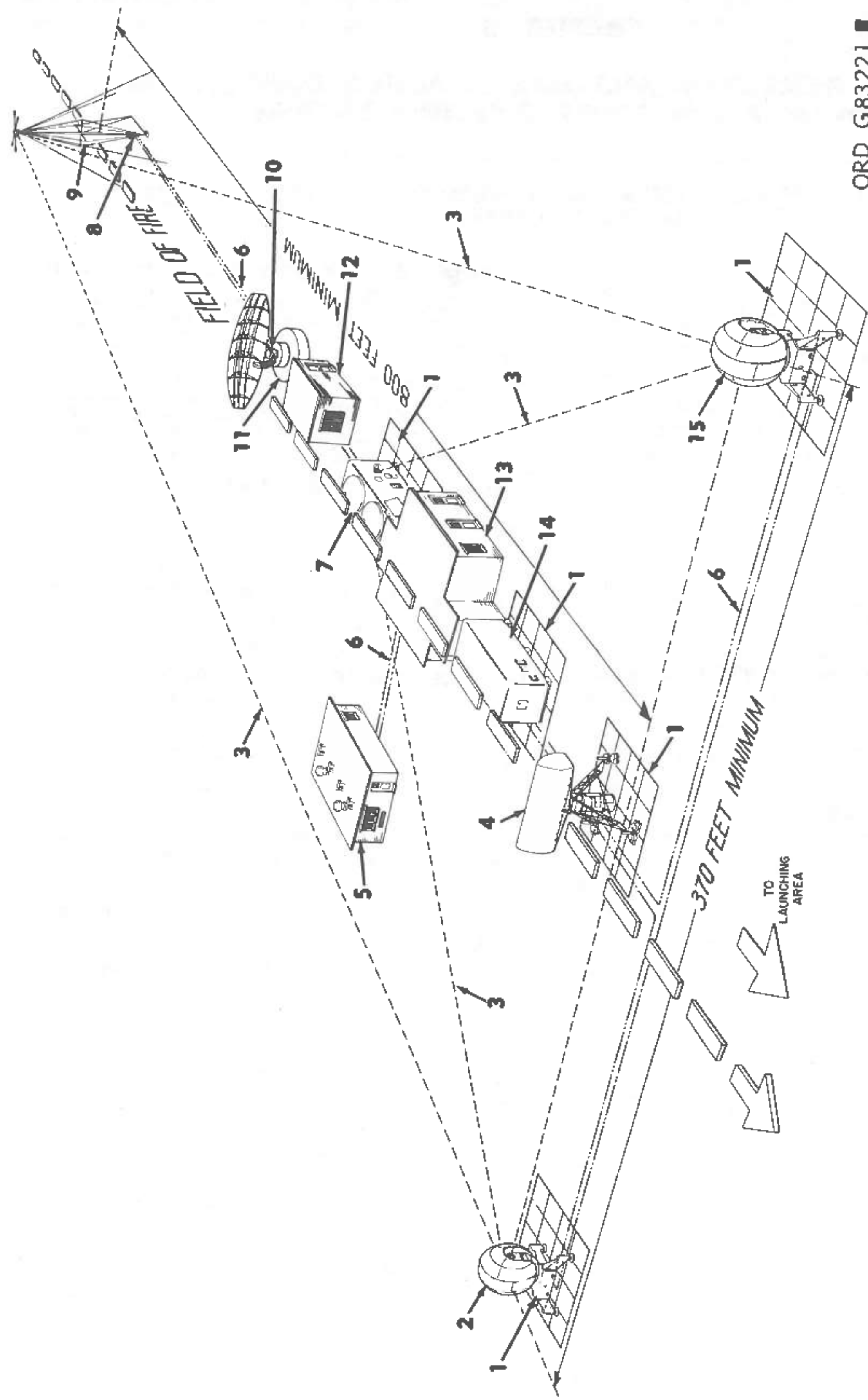
25. Permanent Installation

Figure 14 illustrates a typical permanent layout of major components of the radar course directing central. A typical installation of this type requires a minimum rectangular area of 370 feet by 800 feet. Where possible, the two 800-foot boundaries are parallel to and equidistant from the field of fire (line designating the most probable approach of targets). All roads in the area are located so that no vehicular traffic is routed over cable paths.

a. Electronic Shop Building. The electronic shop building is constructed of concrete blocks or similar materials, and has an area of approximately 600 square feet. It is centrally located forward of and between the two track antenna-receiver-transmitter groups, so that it does not obstruct the lines of sight between the missile track antenna-receiver-transmitter group, the target track antenna-receiver-transmitter group, and the antenna and mast group OA-1600/T. The electronic shop building provides an interconnecting corridor between the trailer-mounted director station and the trailer-mounted tracking station. It also provides installation facilities for the Fire Unit Integration Facility (FUIF) equipment, storage space for ORD 7 repair parts, tools, and test equipment, and work space necessary to repair malfunctioning equipment.

b. Trailer-Mounted Director Station. The trailer-mounted director station is located at one end of the electronic shop building. The rear door of the trailer opens into the electronic shop building to provide easy accessibility to the electronic shop and the trailer-mounted tracking station. The undercarriage chassis has been removed and the trailer mounted on a concrete pad. The trailer is white in color, approximately 22 feet long, 8 feet wide, and 10 feet high. It provides housing primarily for computing equipment, acquisition radar equipment, and recording equipment.

c. Trailer-Mounted Tracking Station. The trailer-mounted tracking station is located at the opposite end of the electronic shop building from the trailer-mounted director station. Its position is such that a line of sight exists between the trailer-mounted tracking station and each of the track antenna-receiver-transmitter groups. Externally the trailer-mounted tracking station is basically the same as the trailer-mounted director station. The rear of the trailer opens into the electronic shop building to provide access to the electronic shop building and the trailer-mounted director station. It provides housing for missile-tracking radar equipment and target-tracking radar equipment.



1.—Concrete pad
2.—Missile track antenna-receiver-transmitter group
3.—Line of sight
4.—Acquisition antenna-receiver-transmitter group
5.—Engine generator building
6.—Cable path
7.—Trailer mounted tracking station
8.—Radar test set TS-847A/MSW-1
9.—Antenna-mast group OA-1600/T
10.—AAR antenna group (selected systems only)
11.—Concrete base (selected systems only)
12.—AAR shelter (selected systems only)
13.—Electronic shop building
14.—Trailer mounted director station
15.—Target track antenna-receiver-transmitter group

Figure 14 (U). Radar course directing central—typical permanent layout.

d. Acquisition Antenna-Receiver-Transmitter Group. The acquisition antenna-receiver-transmitter group is located to the rear of the electronic shop building and centrally between the two track antenna-receiver-transmitter groups. Its position is such that it does not obstruct the line of sight between the two track antenna-receiver-transmitter groups. It is emplaced on a concrete pad. Its maximum distance from the trailer mounted director station is limited by the length of the interconnecting cables. It consists basically of the transmitting and receiving equipment associated with the acquisition radar system.

e. Target Track Antenna-Receiver-Transmitter Group and Missile Track Antenna-Receiver-Transmitter Group. The target and missile track antenna-receiver-transmitter groups are located equidistant from the trailer mounted tracking station and to the rear of the acquisition antenna-receiver-transmitter group. The maximum distance of each track antenna-receiver-transmitter group from the trailer mounted tracking station is 250 feet. Each is mounted on a concrete pad. The target track antenna-receiver-transmitter group consists basically of the transmitting and receiving equipment associated with the target tracking radar system; the missile track antenna-receiver-transmitter group consists basically of the transmitting and receiving equipment associated with the missile tracking radar system.

f. Engine Generator Building. The engine generator building is a concrete block structure located near the electronic shop building in a position such that it does not obstruct the line of sight between either of the two track antenna-receiver-transmitter groups and the trailer mounted tracking station. The engine generator building provides housing facilities for generators, converters, and associated power equipment required by the radar course directing central.

g. Antenna and Mast Group OA-1600/T and Radar Test Set TS-847A/MSW-1.

(1) The antenna and mast group OA-1600/T is 60 feet high, and is located 600 to 800 feet forward of each of the track antenna-receiver-transmitter groups. It is mounted on a small concrete pad and held in position by guy wires. A line of sight exists between the two track antenna-receiver-transmitter groups and the top of the antenna and mast group.

(2) The radar test set TS-847A/MSW-1 is on a frame mounted at the bottom of the antenna and mast group. The antenna and mast group and the radar test set consist of equipment necessary for checking the target and missile tracking radar system.

h. Radar Signal-Simulator Station AN/MPQ-T1 (T1 trainer). Radar signal-simulator station AN/MPQ-T1 (T1 trainer) (fig. 14.1) is used to train personnel in the operation of the radar course directing central and may be connected to all NIKE-HERCULES systems. The location of the trainer with respect to radar course directing central system compenents is at the discretion of the using organization. The trailer housing the trainer contains all the necessary training equipment.

i. AAR Shelter and AAR Antenna Group (Selected Systems Only). The AAR (auxiliary acquisition radar) shelter and AAR antenna group are located at the rear of the trailer mounted director station and on the primary target line as defined by figure 14. All equipment relating to the AAR system is housed in the AAR shelter and the AAR antenna group. The AAR system is physically described in (1) and (2) below. Technical data of the AAR system is described in (3) below.

(1) *AAR Shelter.* The AAR shelter contains all the equipment of the AAR operating group and the associated plan position indicator (PPI).

(2) *Antenna Group.* The AAR antenna group consists of the antenna, the antenna pedestal, a power cable, and waveguide sections that connect the antenna pedestal to the duplexer.

(3) *Techanical Data.*

Range:

Maximum . . . 400,000 yards

Minimum . . . 600 yards

Azimuth . . . . . . Continuous 6400 mils at 6 rpm clockwise rotation of the antenna.

Peak rf power output . . . . . . 500 kilowatts

26 (U). Semimobile Installation

a. Figure 15 illustrates a typical semimobile layout of major components of the radar course directing central. The minimum area requirements, the placement of the area with respect to the field of fire, the line of sight requirements, and the requirements for placement of major components are the same as given for a permanent installation in paragraph 25.

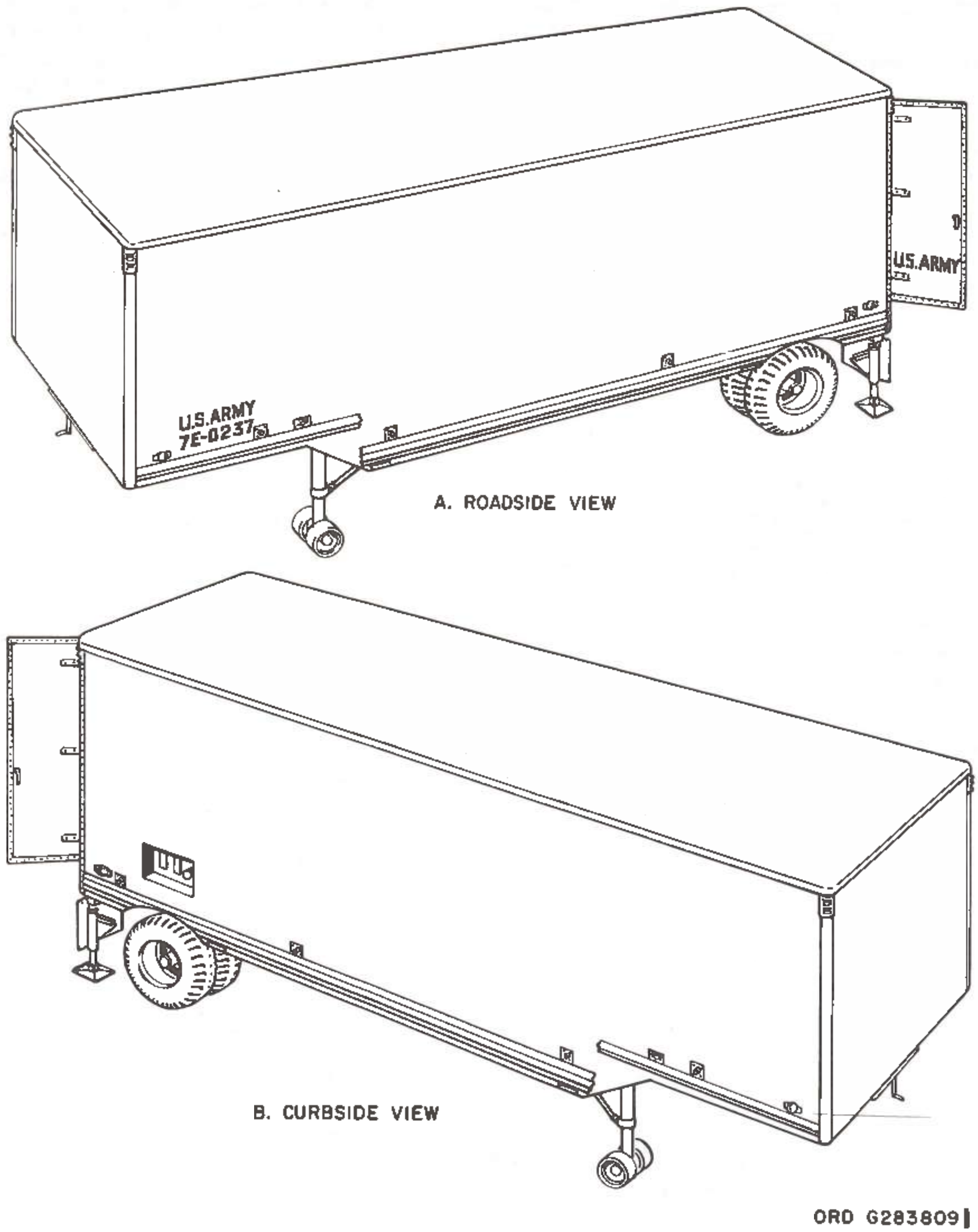


Figure 14.1 (U). Radar signal-simulator station AN/MPQ-T1 (T1 trainer) (U).

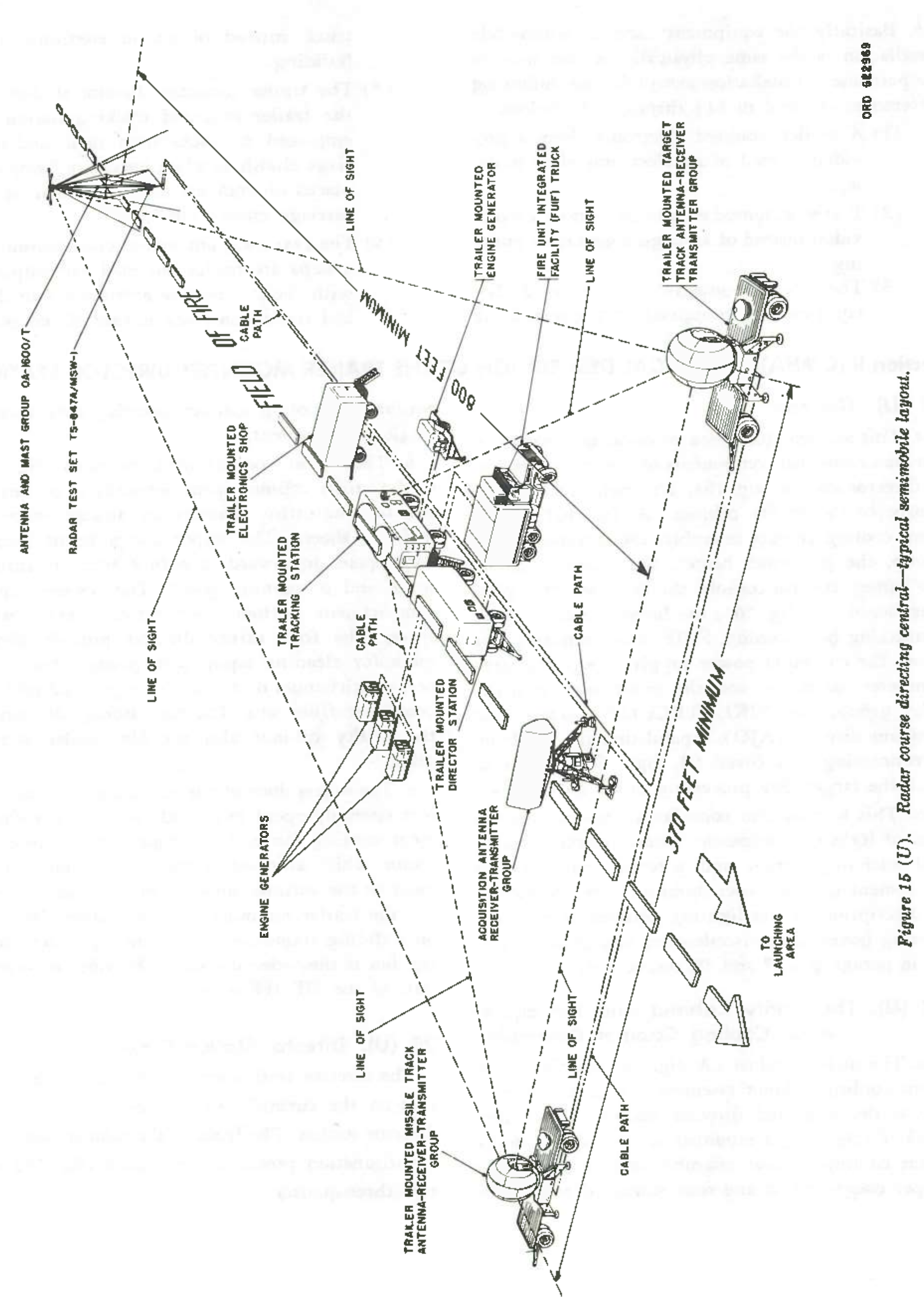


Figure 15 (U). Radar course directing central—typical semimobile layout.

b. Basically the equipment used in semimobile installation is the same physically as that used in the permanent installation except for the following differences as listed in (1) through (5) below.

(1) A trailer-mounted electronic shop is provided instead of an electronic shop building.

(2) Trailer-mounted engine generators are provided instead of an engine generator building.

(3) The fire unit integration facility (FUIF) equipment is contained in a special FUIF truck instead of an an electronic shop building.

(4) The trailer mounted director station and the trailer mounted tracking station are emplaced on jacks with their undercarriage chassis in place instead of being emplaced on concrete pads with their undercarriage chassis removed.

(5) The two track antenna-receiver-transmitter groups are trailer mounted and emplaced with their respective antenna mount drop bed trailers in place instead of removed.

Section II (CMHA). PHYSICAL DESCRIPTION OF THE TRAILER MOUNTED DIRECTOR STATION

27 (U). General

a. This section contains a physical description of the major internal components of the trailer mounted director station (fig. 16). The major components consist of the utility cabinet (A, fig. 16), equipment cooling cabinet assembly, the director station group, the personnel heater, the recorder group, the battery control console, the early warning plotting board (B, fig. 16), the battery control interconnecting box housing, FUIF interconnecting box cover, the computer power supply group, the servo computer assembly, and the computer amplifier-relay group. For NIKE-HERCULES systems with anti-jam display (AJD) capabilities, the FUIF interconnecting box cover (B, fig. 16) is replaced with the target data processing unit (2, fig. 26.1).

b. This section also contains a physical description of lighting equipment, interconnecting boxes, and various internal and external miscellaneous equipment of the trailer mounted director station. A description of the lighting equipment interconnecting boxes, and miscellaneous equipment is given in paragraphs 37 and 38, respectively.

28 (U). The Utility Cabinet and the Equipment Cooling Cabinet Assembly

a. The utility cabinet (A, fig. 16) and the equipment cooling cabinet assembly are in the rear of the trailer mounted director station. The utility cabinet (fig. 17) is mounted on top of the equipment cooling cabinet assembly and consists of an upper compartment and four storage drawers. The equipment cooling cabinet assembly consists of a single compartment.

b. The upper compartment top door (fig. 18) of the utility cabinet opens vertically to permit access to four utility drawers and storage space for logbook sheets. The upper compartment bottom door opens downward to permit access to storage space and a warning panel. The lowered upper compartment bottom door provides extra work space. The four utility drawers provide storage space for cleaning equipment, plotting board paper, multichannel data recorder paper, and plotting board pen-filler kits. The four storage drawers of the utility cabinet also provide similar storage space.

c. The access door of the equipment cooling cabinet assembly opens to provide access to the equipment cooling fan and the equipment cooling fan motor, which are used to cool the electronic equipment in the various cabinets and consoles throughout the trailer mounted director station. Mounted on a sliding frame forward of the equipment cooling fan is the video decoder. The video decoder is part of the SIF/IFF system.

29 (U). Director Station Group

The director station group (A, fig. 16) is a cabinet on the curbside wall of the trailer mounted director station. The front of the cabinet consists of an acquisition power control panel (fig. 19) and two three-quarter

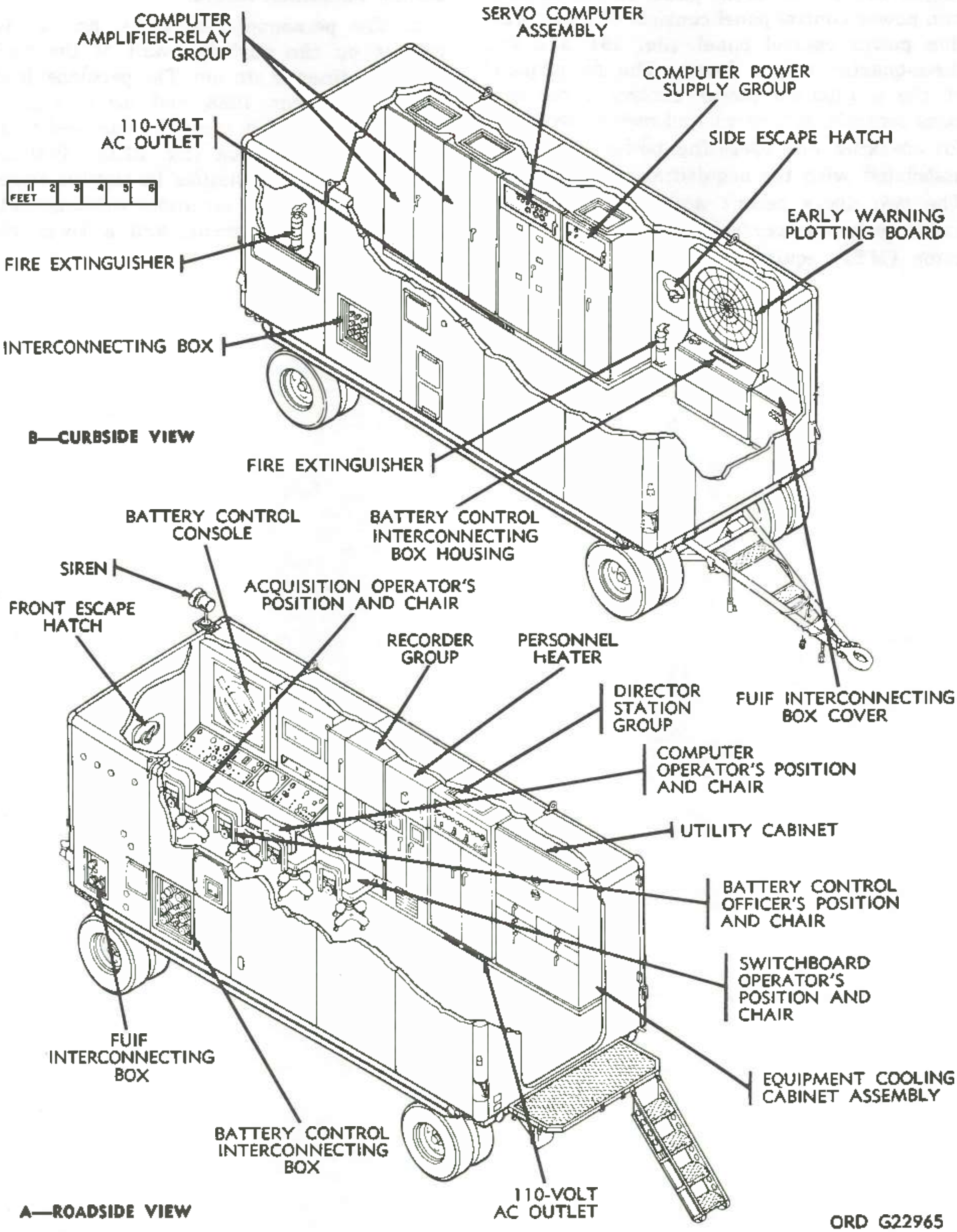


Figure 16 (U). Trailer mounted director station—cutaway views.

length doors. The front panel of the acquisition power control panel consists of an acquisition power control panel (fig. 19) and two three-quarter length doors. The front panel of the acquisition power control panel contains controls, indicators, and meters necessary for checking and operating power equipment associated with the acquisition radar system. The two doors permit access to acquisition radar system power and moving target indicator (MTI) equipment.

30 (U). Personnel Heater

a. The personnel heater (A, fig. 16) is a cabinet on the curbside wall of the trailer mounted director station. The personnel heater used in systems 1086 and below (fig. 21) differs in operation from the one used in systems 1087 and above (fig. 21.1). Both personnel heaters are similar in physical appearance and consist of an upper compartment, a lower left compartment, and a lower right compartment.

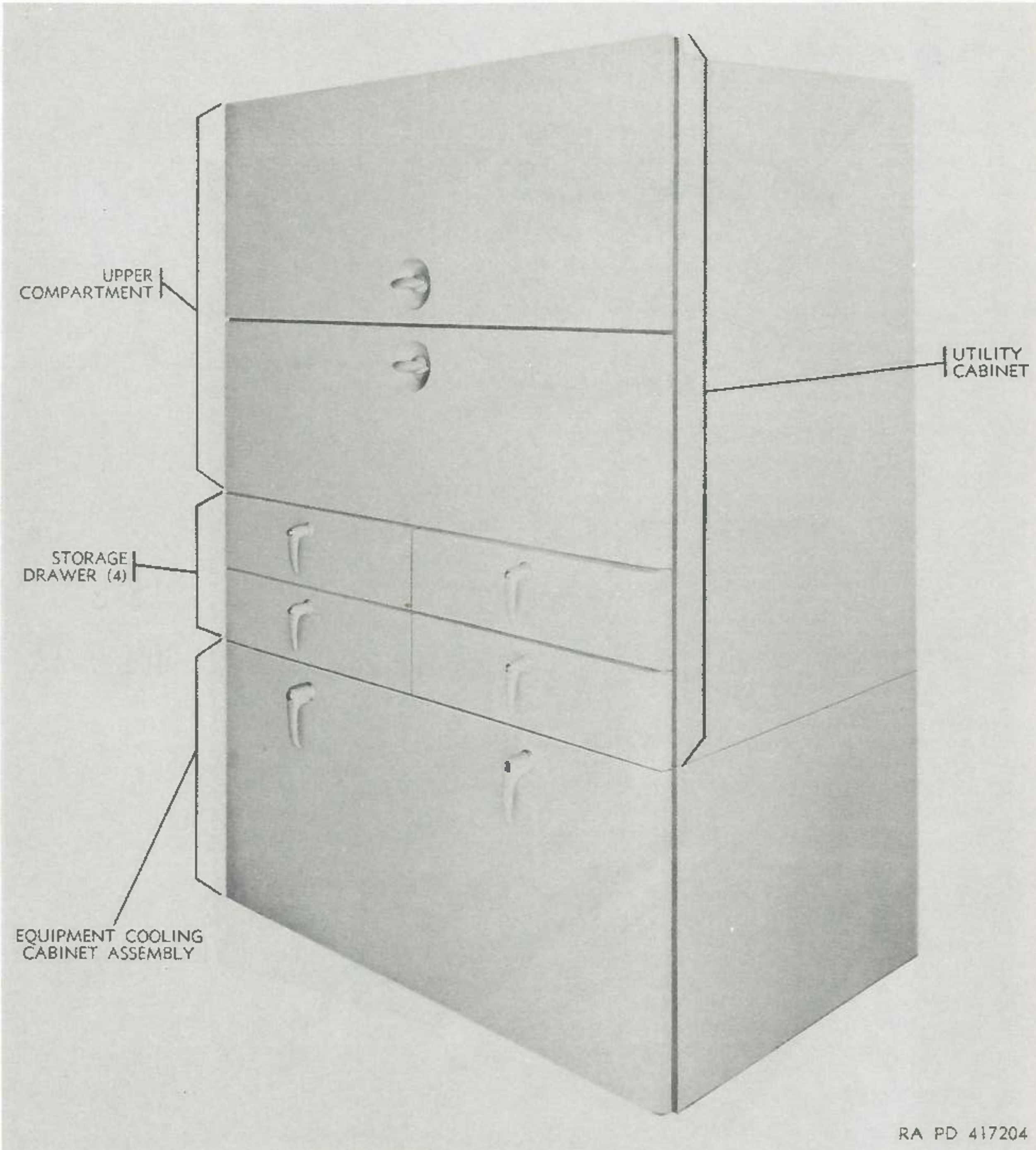


Figure 17. Utility cabinet and equipment cooling cabinet assembly—oblique view.

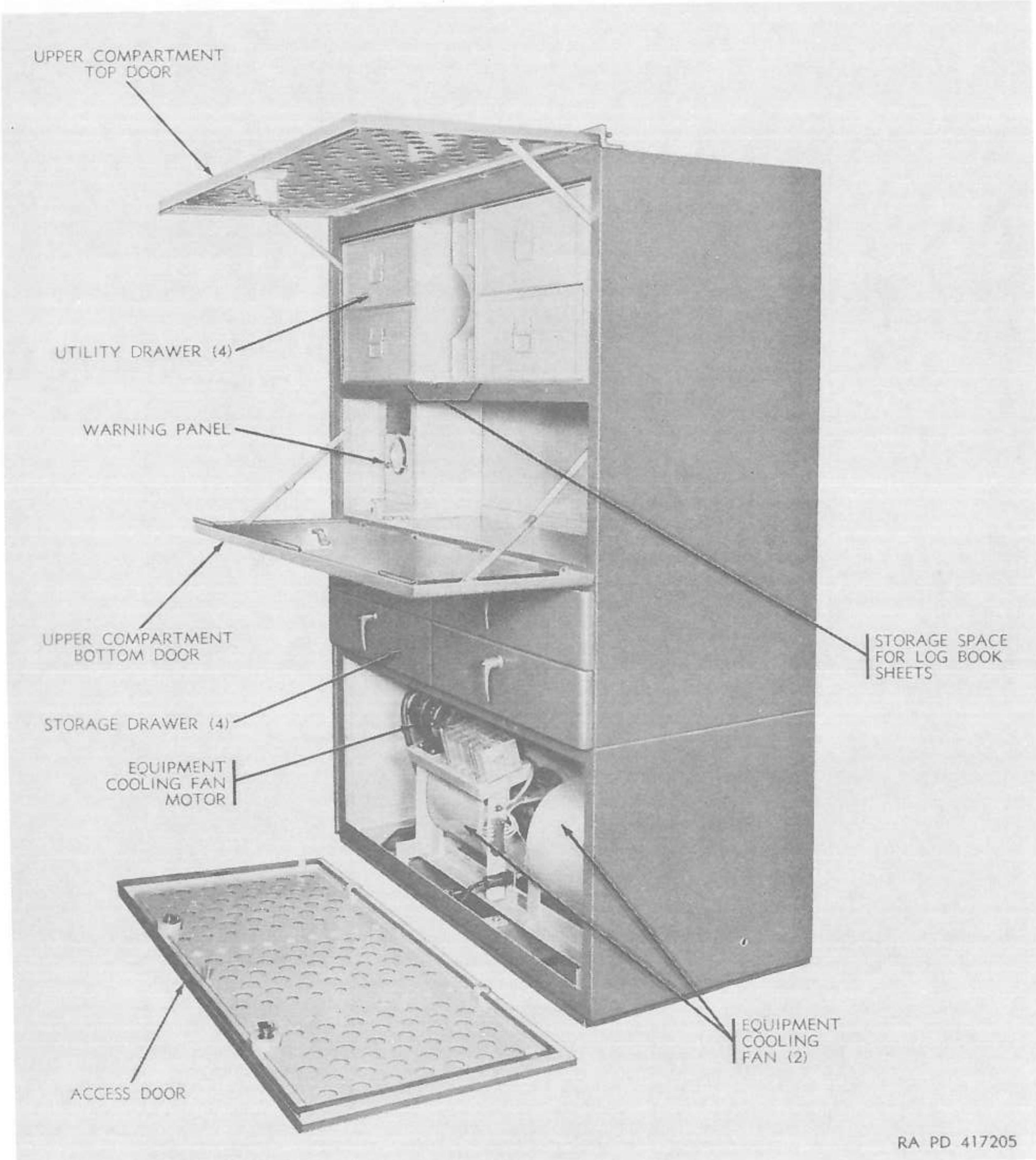


Figure 18. The utility cabinet and the equipment cooling cabinet assembly—front view—doors open.

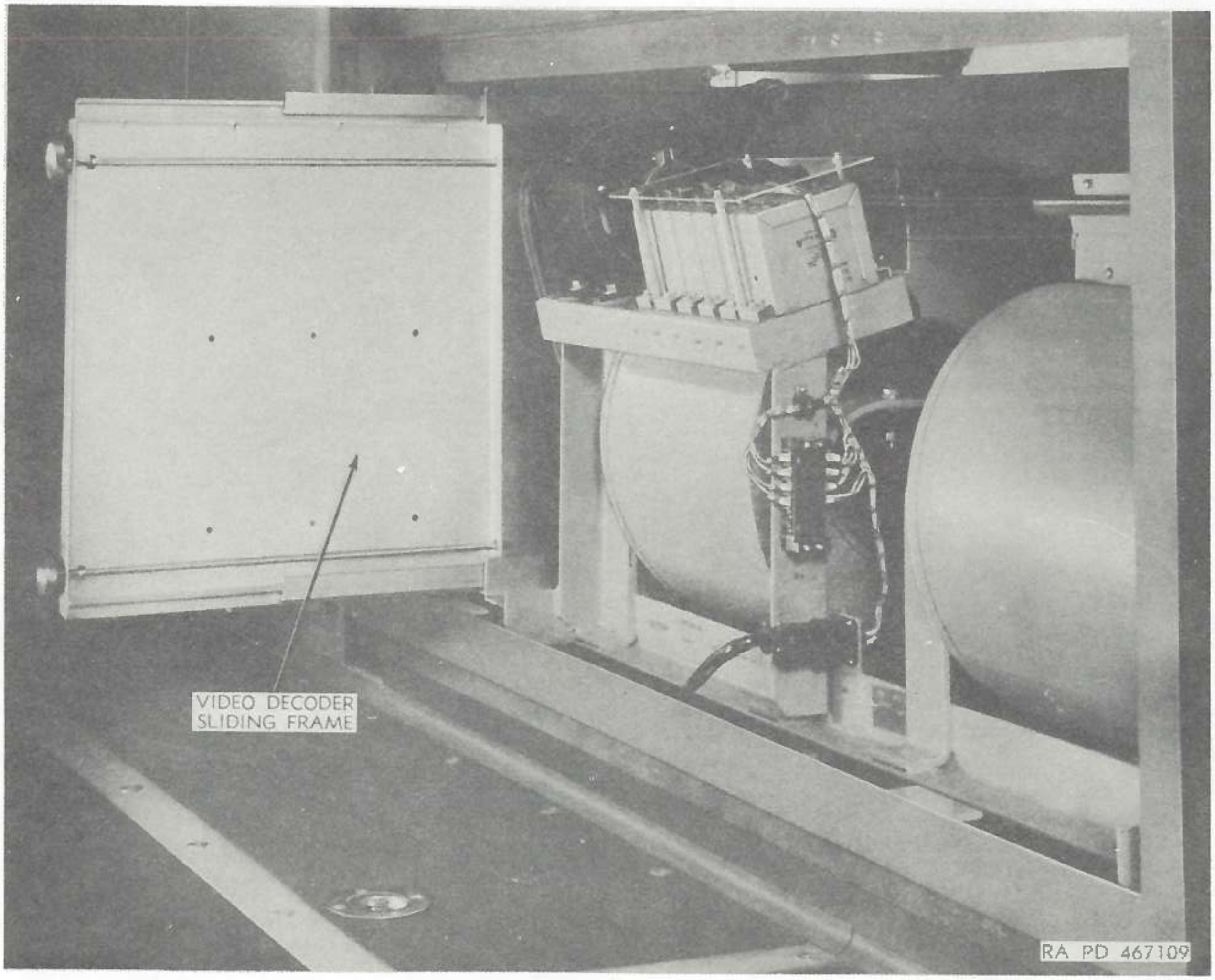


Figure 18.1. Equipment cooling cabinet—video decoder sliding frame extended.

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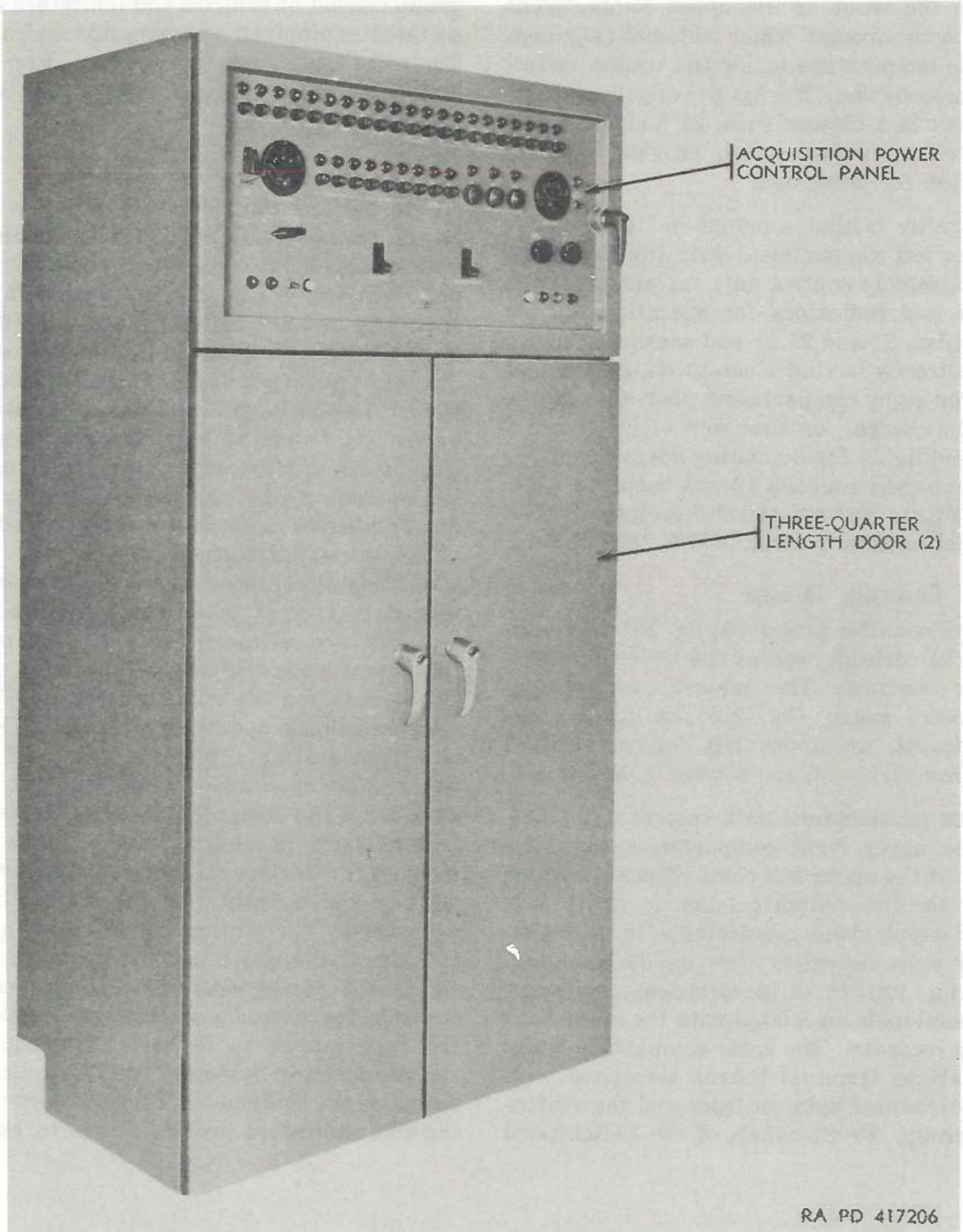


Figure 19. Director station group—oblique view.

b. On the front of the upper compartment door is a thermostat which automatically controls the temperature inside the trailer mounted director station. Behind the upper compartment door is a blower (figs. 21 and 21.1) and associated equipment which provide adequate ventilation for personnel.

c. Directly behind a cutout on the front of the lower left compartment door (fig. 20) is the heater assembly control unit, on which are the controls and indicators for operating the air heater (figs. 21 and 21.1) and associated equipment. Directly behind a cutout on the front of the lower right compartment door (fig. 20) is a battery charger, on the front of which are a meter and lights for indicating operation of the battery charger and the 12-volt batteries (figs. 21 and 21.1). For a detailed description of the personnel heaters, refer to TM 9–2330–212–14.

31 (U). Recorder Group

a. The recorder group (A, fig. 16) is a cabinet on the curbside wall of the trailer mounted director station. The cabinet consists of a switchboard group (fig. 22), an upper right compartment, an upper left compartment, a middle compartment, and a lower compartment.

b. The multichannel data recorder (fig. 23) is in the upper right compartment (fig. 22). The top of the upper left compartment provides storage for the cylindrical takeup drum (fig. 23) and supply drum associated with the multichannel data recorder. The middle compartment (fig. 22) contains electrical equipment and special tools associated with the multichannel data recorder. The lower compartment contains various terminal boards associated with the multichannel data recorder and the switchboard group. Front panels of the switchboard group consist of controls and indicators and associated equipment necessary for operation of the voice communication system. For details of the switchboard group, refer to TM 9–1400–251–12.

32 (U). Battery Control Console

The battery control console (A, fig. 16) is on the curbside wall of the trailer mounted director station. It consists primarily of an upper right frame (fig. 24), an upper left frame, six doors, and five indicators, which include the acquisition control-indicator, the precision indicator, the target designate control-indicator, the PPI, and the tactical control-indicator. The upper left frame contains the horizontal plotting board, and the upper right frame contains the altitude plotting board, battery signal panel-indicator, audio alarm speaker, and equipment status indicator lights.

a. The acquisition control-indicator, precision indicator, target designate control-indicator, and PPI are all associated with, and used in, the operation of the acquisition radar system. The acquisition control-indicator and PPI are also used in the operation of the SIF/IFF system. The horizontal plotting board and the altitude plotting board are used to plot output data from the computer, and the tactical control-indicator is used in the operation of the computer. The tactical control-indicator is also used in the operation of the trailer lighting equipment. The battery signal panel-indicator contains lights which indicate the status of the equipment during operation. It also contains controls for selection of the type mission and the type missile to be used. The equipment status indicator lights are used to indicate the status of the equipment. The six doors beneath the five indicators provide access to electrical equipment consisting primarily of terminal boards.

b. Three operators' positions are provided at the battery control console (A, fig. 16). The battery-control officer's position is in front of the PPI (fig. 24). The acquisition operator's position (A, fig. 16) is to the left of the battery-control officer's position, and the computer operator's position is to the right of the battery-control officer's position. Each operator is positioned in front of the equipment associated with the operations for which he is responsible.

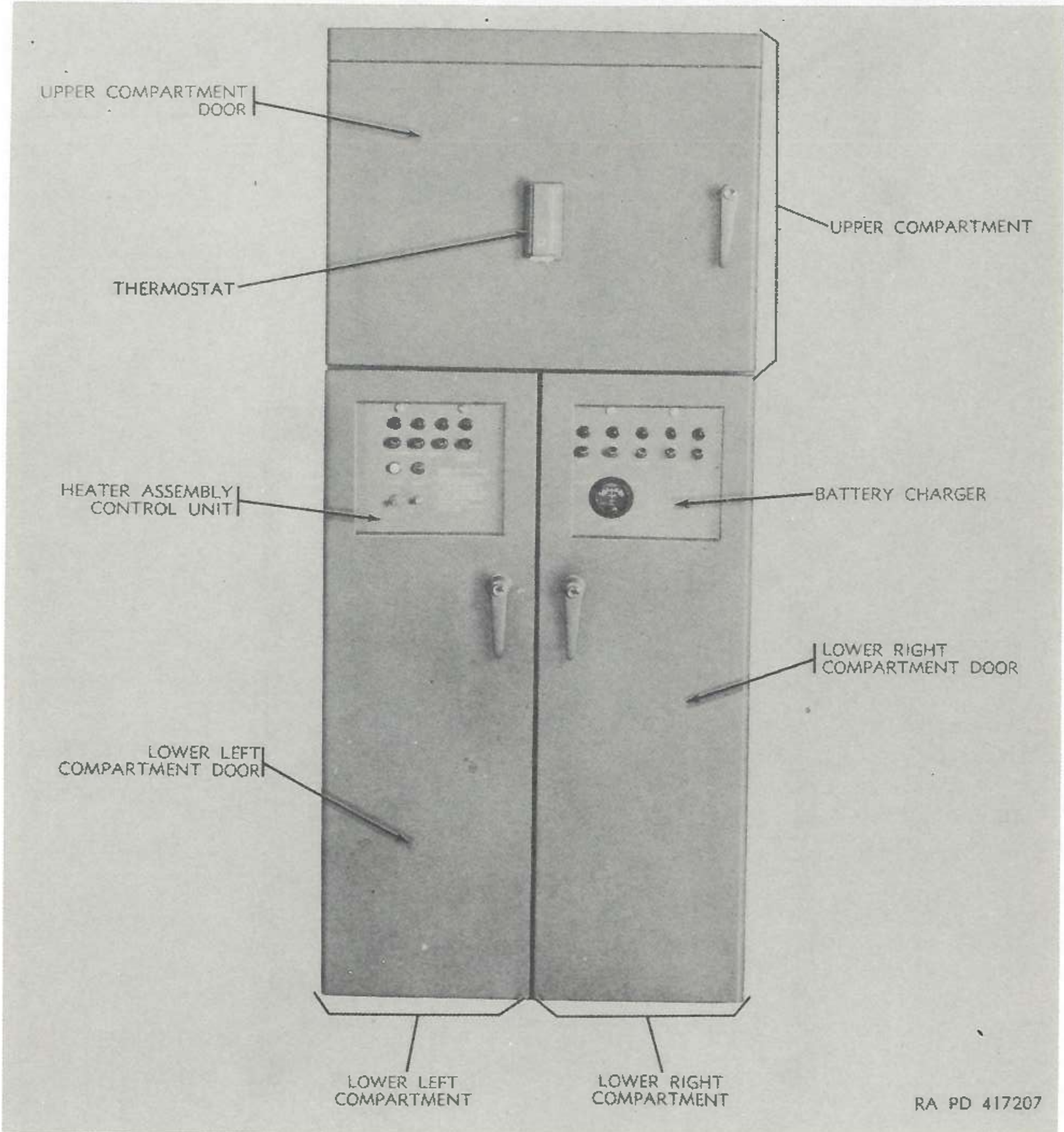


Figure 20. Personnel heater—oblique view.

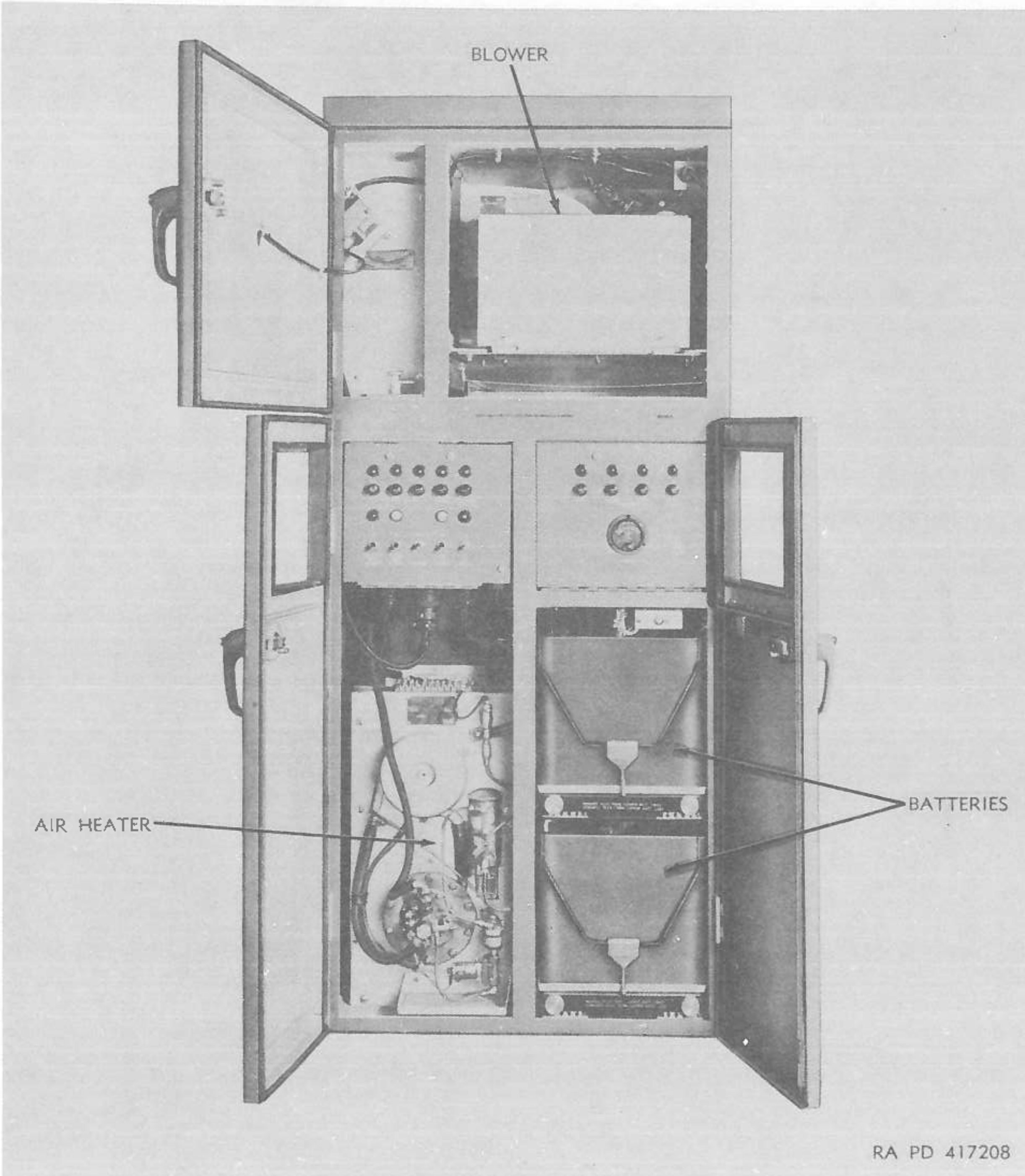


Figure 21. Personnel heater—front view—doors open.
(Systems 1086 and below)

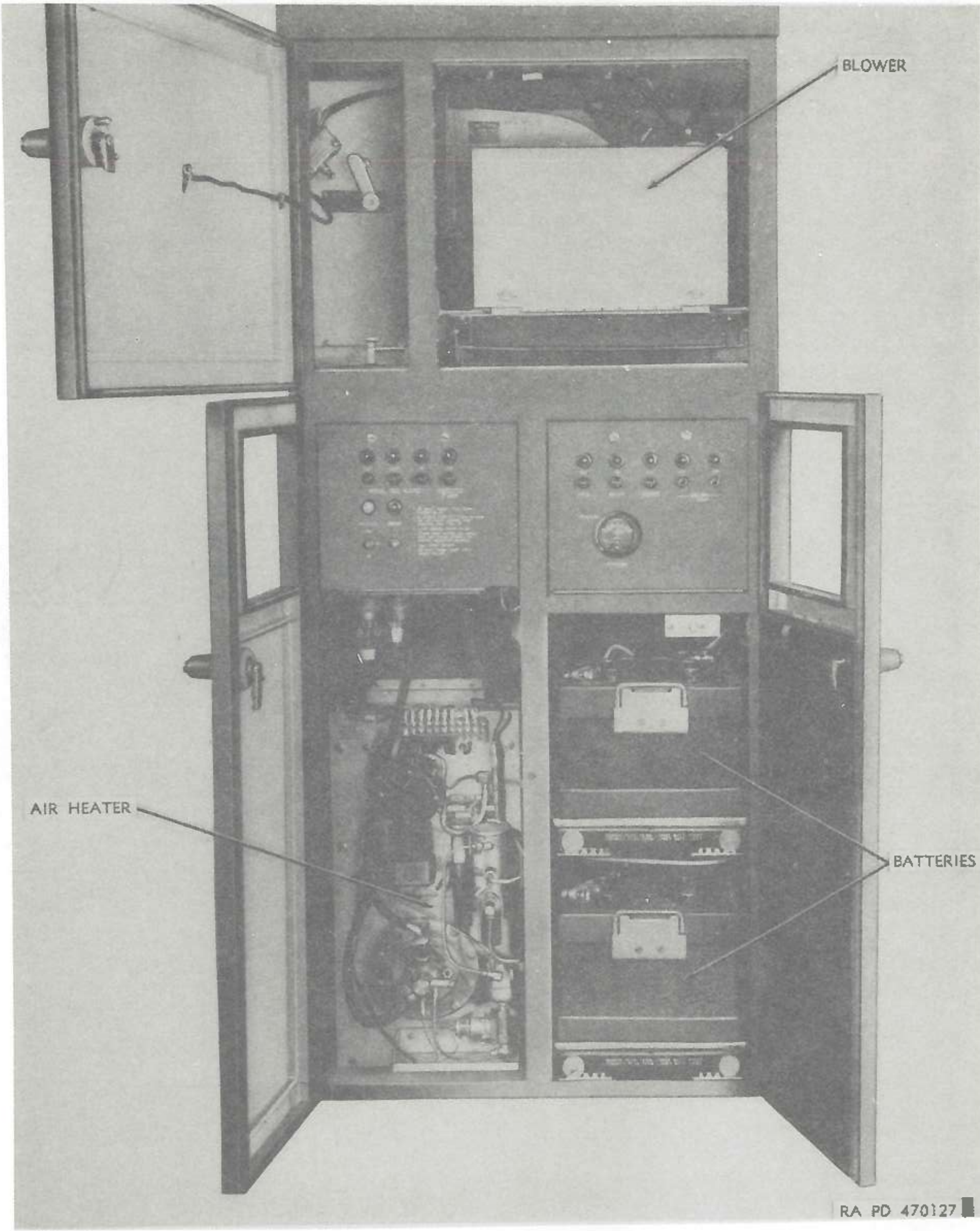


Figure 21.1. Personnel heater - front view - doors open - systems 1087 and above.

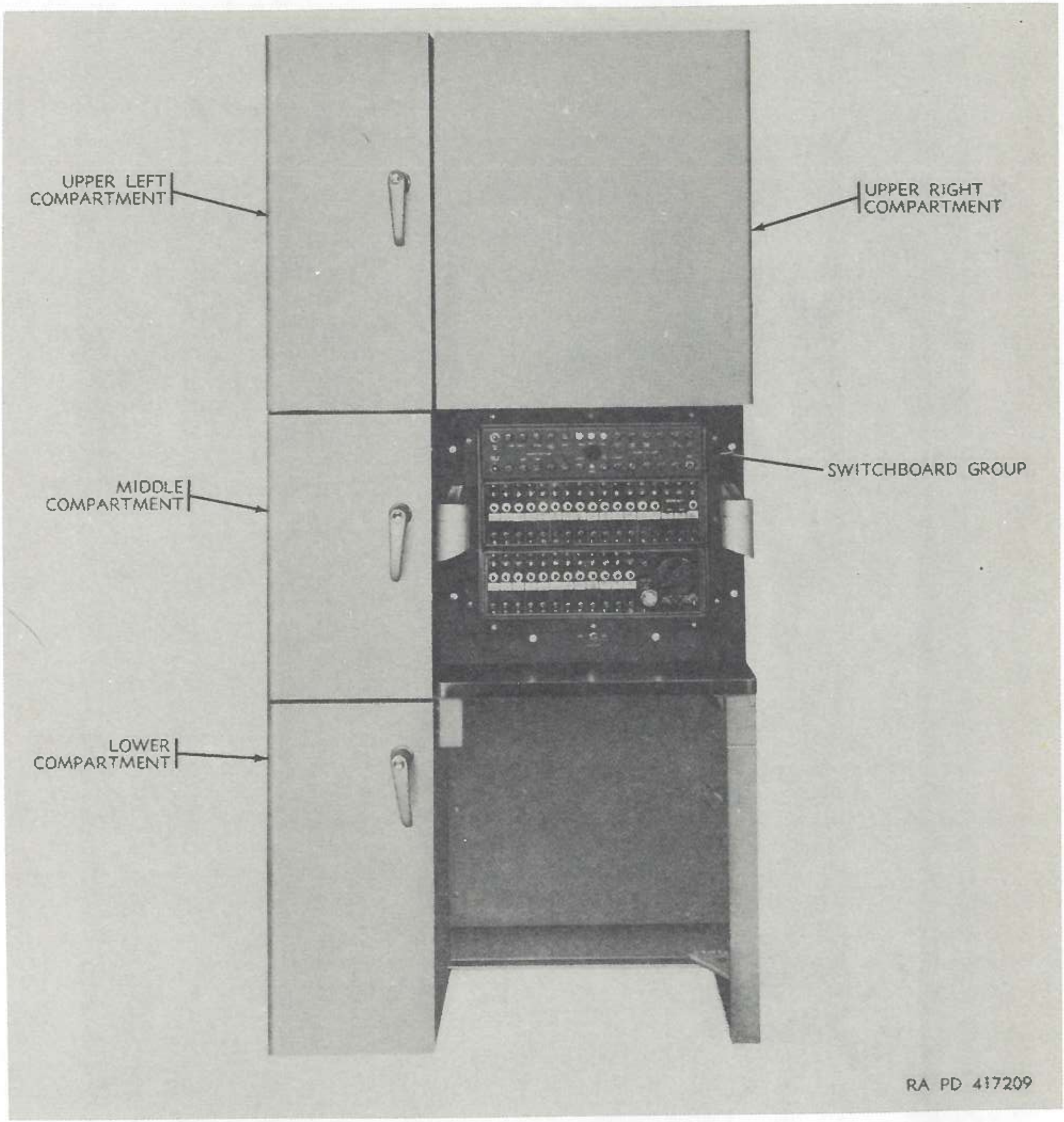


Figure 22. Recorder group—front view.

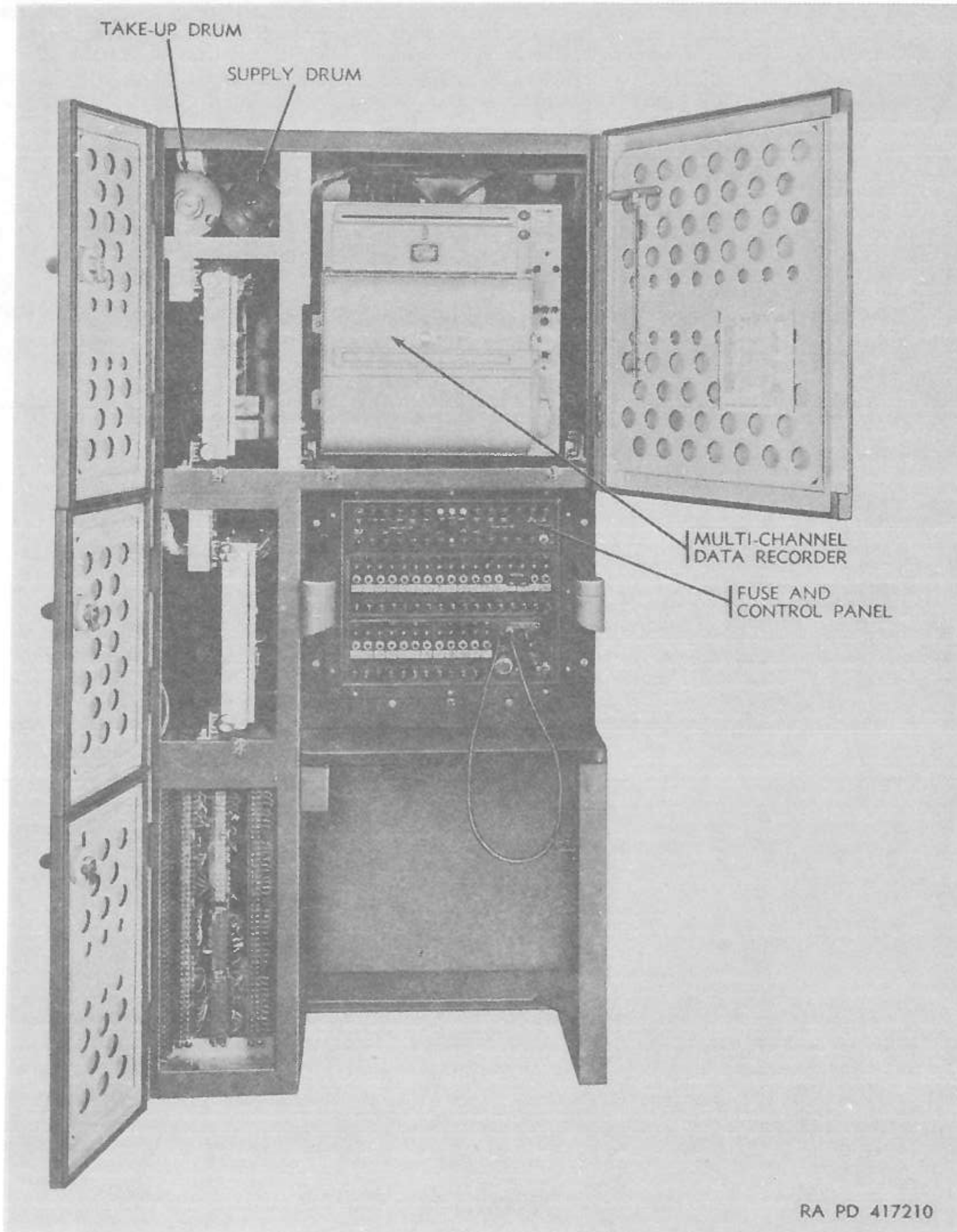


Figure 23. Recorder group—front view—doors open.

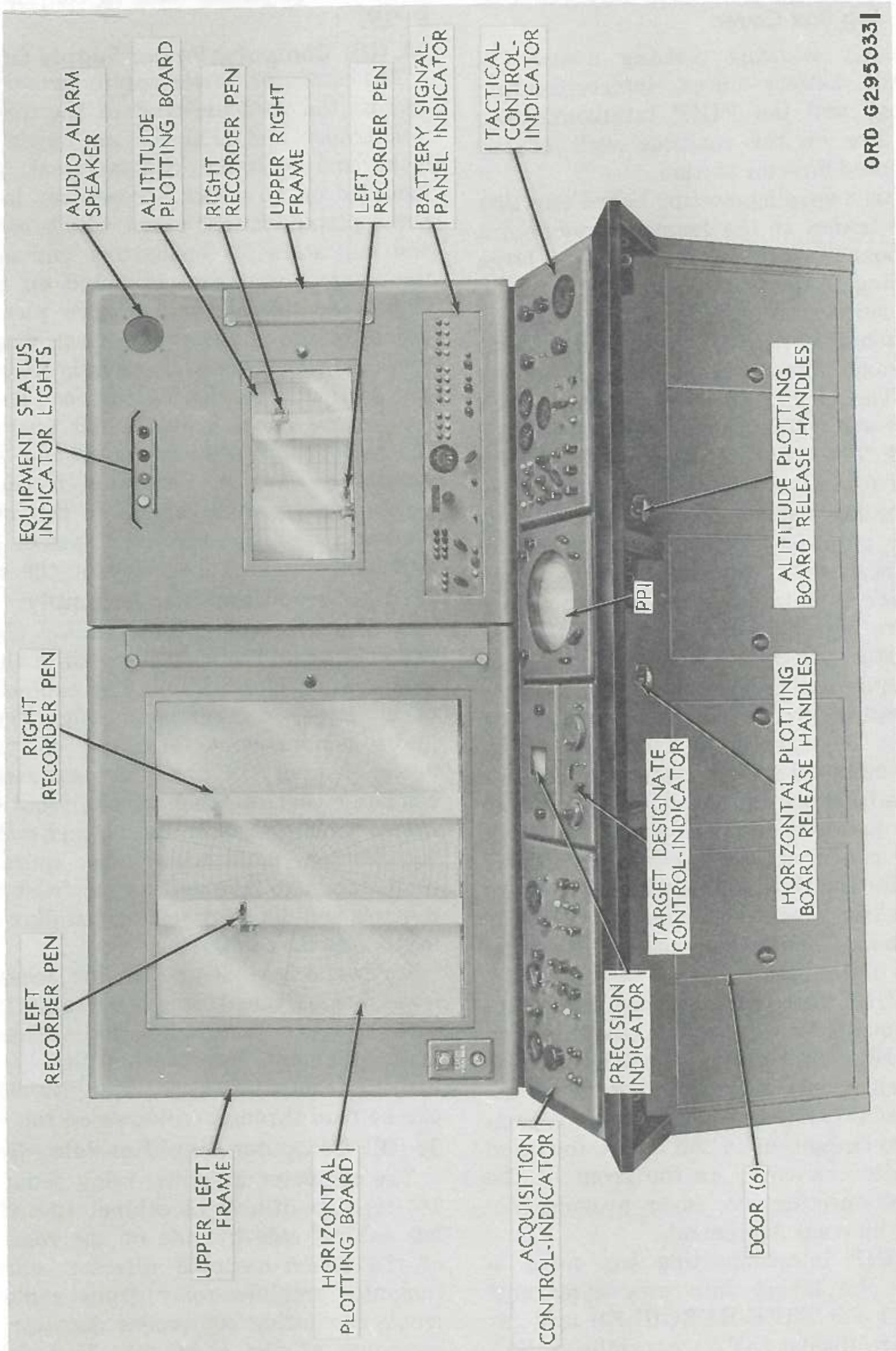


Figure 24 (U). Battery-control console—front view (U).

33 (U). Early Warning Plotting Board, Battery-Control Interconnecting Box Housing, and FUIF Interconnecting Box Cover

a. The early warning plotting board (B, fig. 16), the battery-control interconnecting box housing, and the FUIF interconnecting box cover are on the roadside wall of the trailer-mounted director station.

b. The early warning plotting board (fig. 25) is a square frame. In the frame is mounted a Plexiglas board which is flush with a large round opening in the frame, and behind which is a white surface. The back of the Plexiglas board is etched with lines, representing azimuth and range, from a point in the center of the glass. The etched lines are painted black so that they are easily visible against the white background. The front of the glass is smooth and is used for manual plotting with a grease pencil or similar instrument. This type of plotting board provides facilities for manually plotting target early warning position information which is obtained from an Army Air Defense Fire Distribution System (AADFDS) Missile Master, AADFDS Missile Monitor, or from the acquisition radar system.

c. The battery-control interconnecting box housing (fig. 26) consists of a cabinet on top of which is mounted a work counter. The work counter is adjustable up and down. In the up position it provides a writing and drawing surface for use in conjunction with the early warning plotting board. Beneath the work counter are two access doors behind which is located terminal equipment such as terminal boards and connectors.

d. The FUIF interconnecting box cover contains equipment for connecting, testing, and alining FUIF equipment in the FUIF truck or in the electronic shop building, with acquisition radar system equipment and computer system equipment in the trailer-mounted director station. A cover on the front of the FUIF interconnecting box cover provides access to the internal equipment.

e. The FUIF interconnecting box cover is replaced by the target data processing unit (2, fig. 26.1) for NIKE-HERCULES systems with anti-jam display(APD) capabilities. The target data processing unit consists of three compartments. The upper and middle compartments contain electrical equipment associated with AJD. The lower compartment contains electrical equipment used in conjunction with FUIF.

34. (U). Computer Power Supply Group

The computer power supply group is located against the roadside wall of the director station trailer and contains an upper compartment and a lower compartment (fig. 27). Mounted on an upper access door is the computer power control panel which has controls and indicators for energizing and monitoring the computer system. Mounted on the upper right-hand side of the computer power supply group is the simulator control panel which contains indicators and controls to be used in conjunction with the T1 trainer. The simulator control panel provides the operator with the facility for selecting a live or simulated missile for use in simulated missions. Two access doors provide access to the lower compartment which contains power supplies necessary for the operation of the computer.

35 (U). Servo Computer Assembly

a. The servo computer assembly (B, fig. 16) is a cabinet on the roadside wall of the trailer-mounted director station. The cabinet consists of an upper compartment (fig. 28), and a lower compartment. Mounted on the upper access door of the upper compartment is the computer control-panel, on the front of which are controls, indicator lights, and meters used for testing, monitoring, and operating the computer. Also mounted on the front panel are controls and dials for setting parallax measurements into the computer.

b. Two access doors provide access to the lower compartment which contains three ballistic computer assemblies and various associated equipment. Information displayed by the ballistics computers appears on five dials which can be read through windows on the doors.

36 (U). Computer Amplifier-Relay Group

The computer amplifier-relay group (B, fig. 16) consists of a right cabinet (fig. 29) and a left cabinet side by side on the roadside wall of the trailer-mounted director station. The computer amplifier-relay group contains electronic computing equipment necessary for the operation of the computer. Two full length doors on the front of each cabinet permit access to the electronic computing equipment.

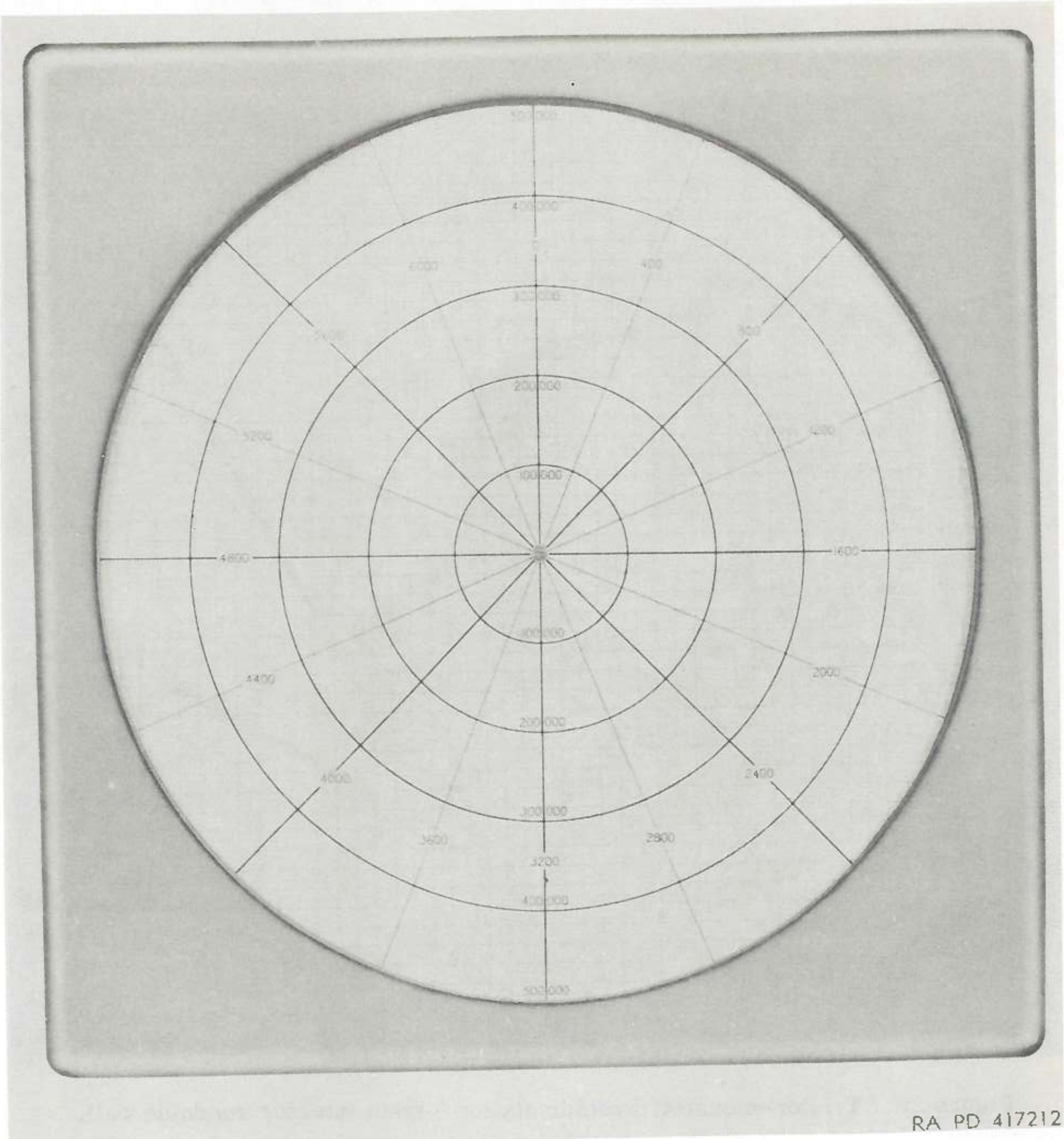


Figure 25. Early warning plotting board - front view.

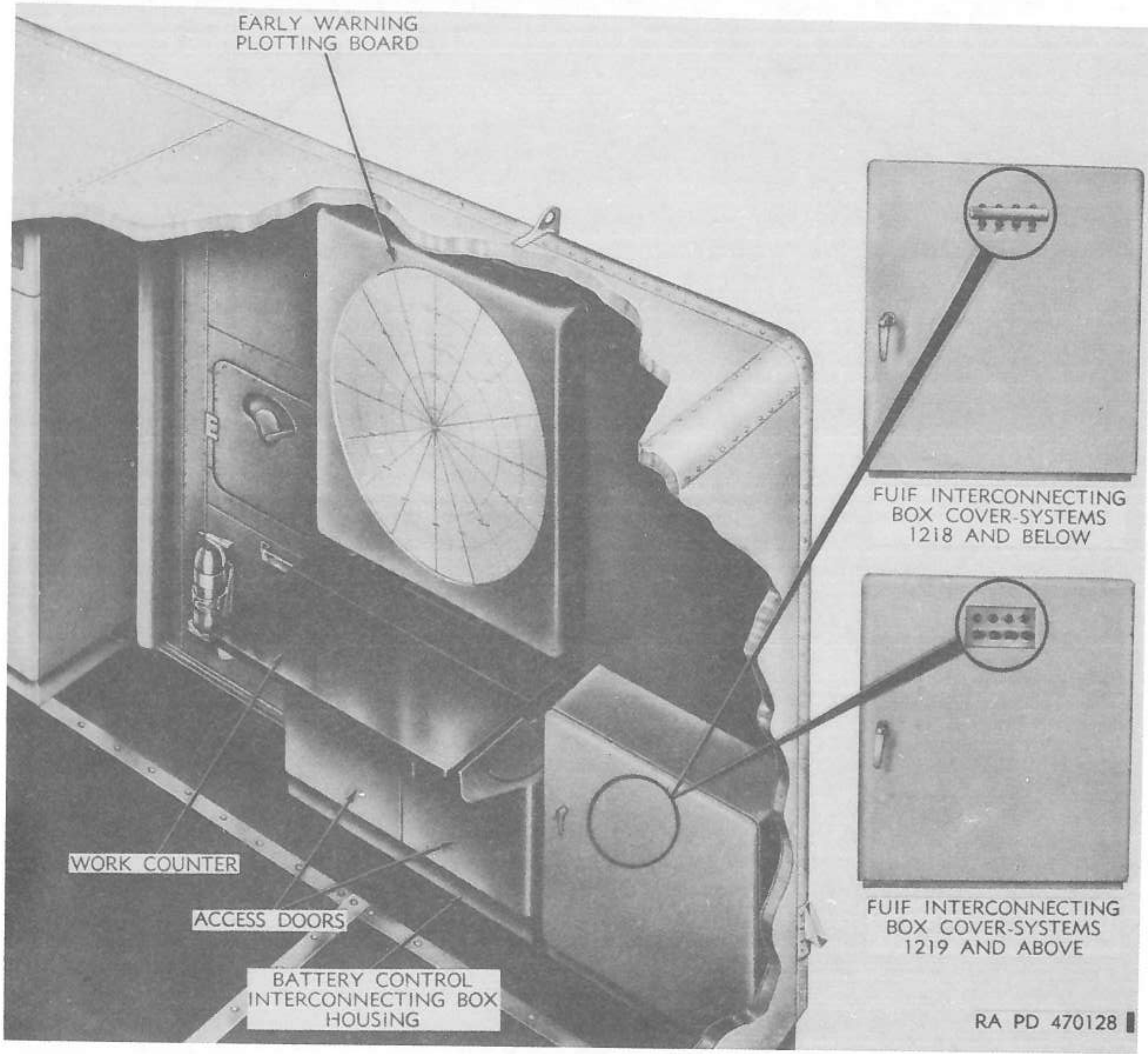
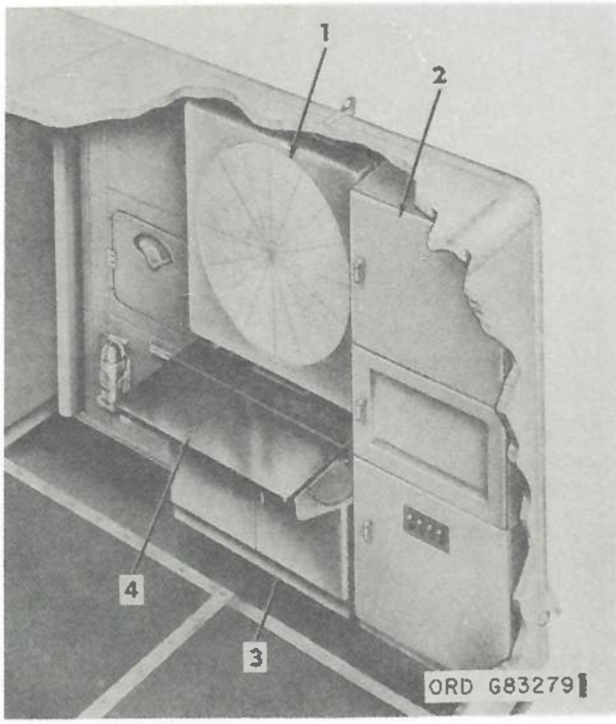


Figure 26. Trailer-mounted director station - front interior roadside wall.



1—Early warning plotting board
2—Target data processing unit
3—Battery control interconnecting box housing
4—Work counter

Figure 26.1 (U). Trailer mounted director station—front interior roadside wall.

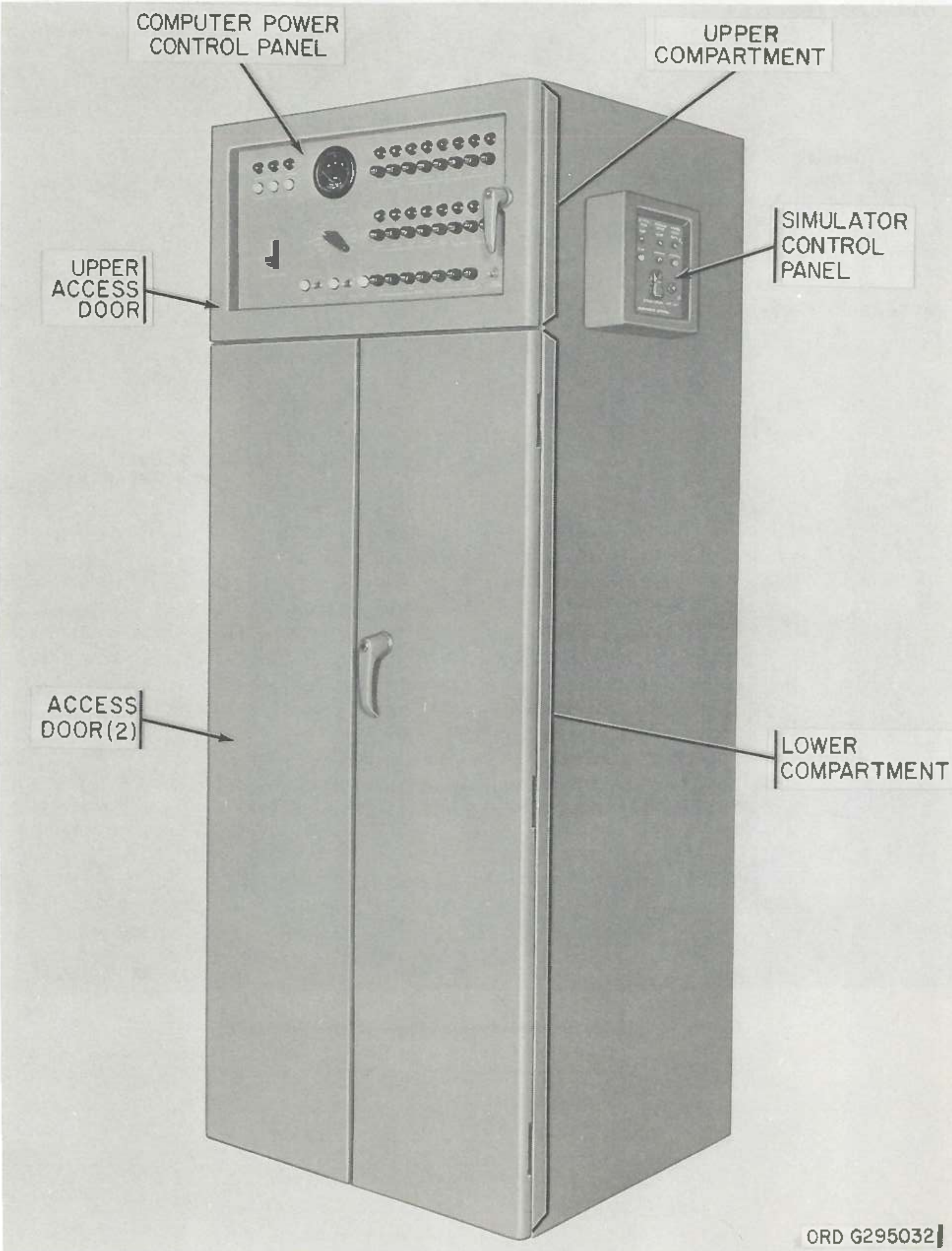


Figure 27 (U). Computer power supply group—oblique view (U).

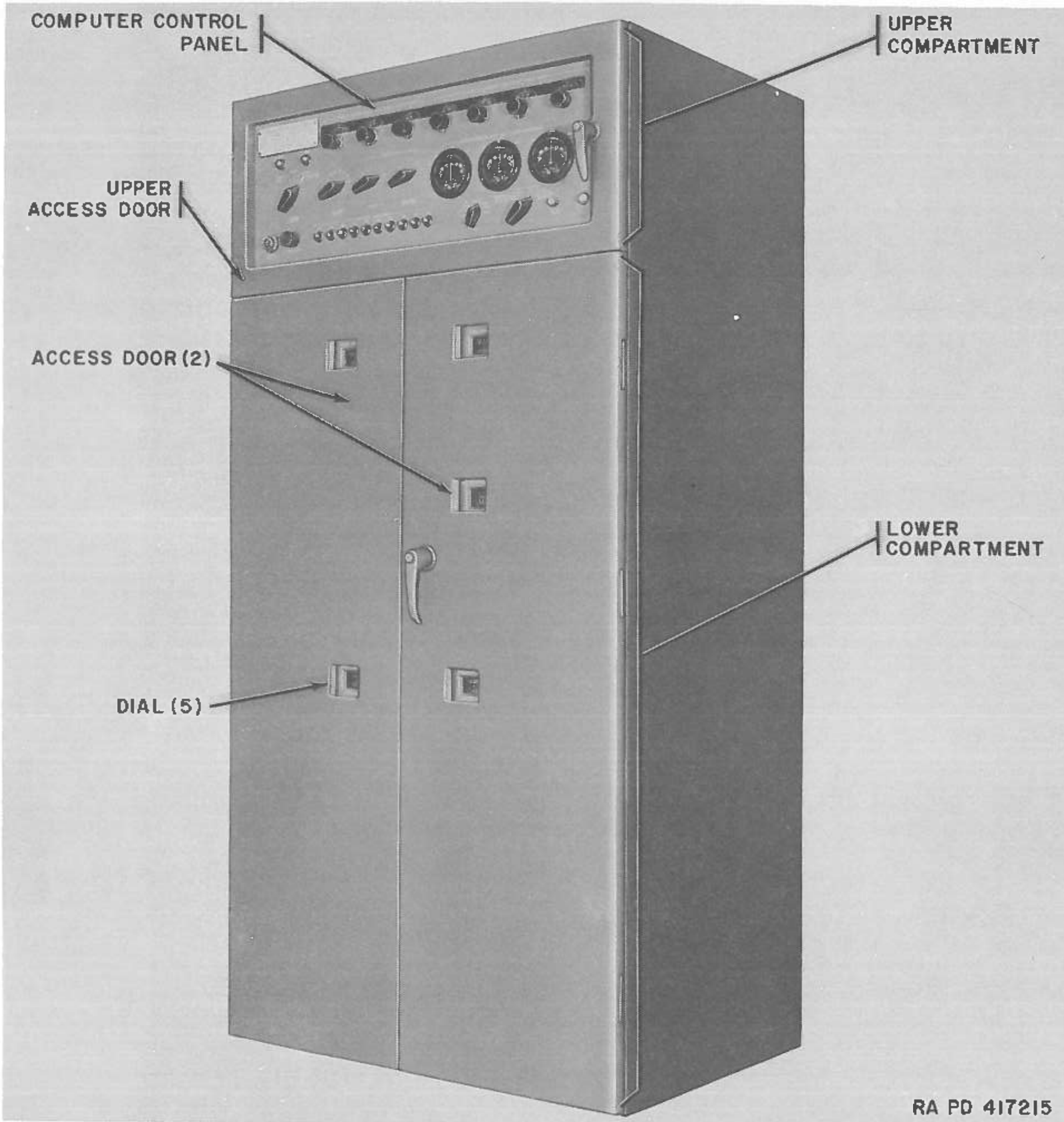


Figure 28 (U). Servo computer assembly—oblique view (U).

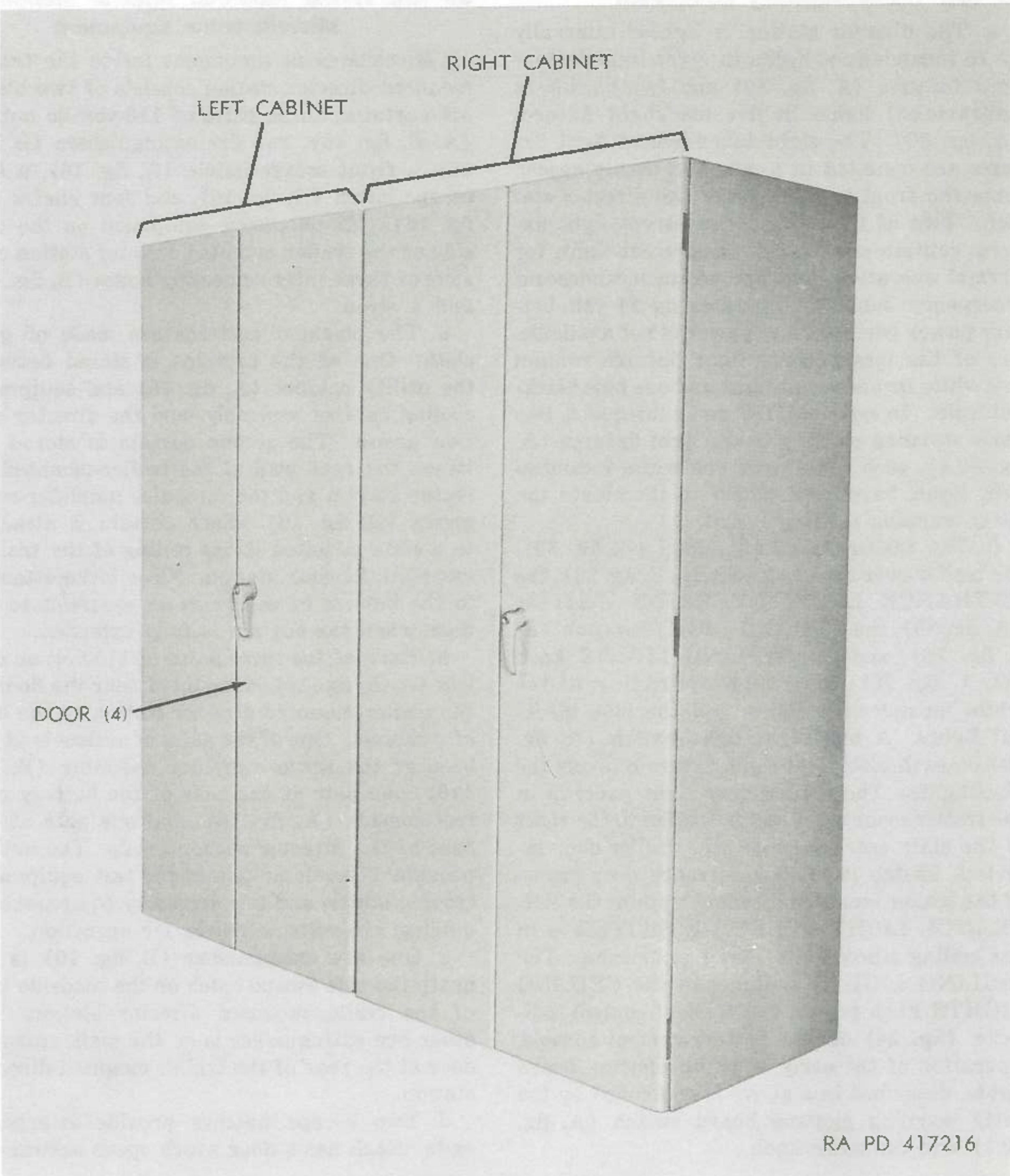


Figure 29. Computer amplifier-relay group—oblique view.

37 (U). Trailer Lighting Equipment

a. The director station is lighted internally by 16 incandescent lights in eight incandescent light fixtures (A, fig. 30) and five blacklight (ultraviolet) lights in five blacklight fixtures (A, fig. 30). The eight incandescent light fixtures are mounted in a row and evenly spaced from the front to the rear of the director station. Two of the eight incandescent light fixtures contain one white incandescent light, for normal operation, and one white incandescent emergency light that operates on 24 volt battery power when normal power is not available. Six of the incandescent light fixtures contain one white incandescent light and one blue blackout light. In systems 1187 and subsequent, two early warning plotting board light fixtures (A, fig. 30.1), each containing one white incandescent light, have been added to illuminate the early warning plotting board.

b. The trailer door light panel (B, fig. 30), the trailer door interlock switch (B, fig. 30), the ENTRANCE LIGHT OVERRIDE SWITCH (A, fig. 30), the CEILING LIGHTS switch (K, 1, fig. 78), and the CEILING LIGHTS knob (M, 1, fig. 78) control the operation of the white incandescent lights and the blue blackout lights. A blacklight light switch (A, fig. 30) on each blacklight light fixture controls the blacklights. The trailer door light panel is in the trailer mounted director station to the right of the main entrance door; the trailer door interlock switch is on the entrance door frame of the trailer mounted director station; the ENTRANCE LIGHT OVERRIDE SWITCH is in the ceiling above the main entrance. The CEILING LIGHTS switch and the CEILING LIGHTS knob are on the tactical control-indicator (fig. 24) on the battery-control console. Operation of the early warning plotting board lights, described in *a* above is controlled by the early warning plotting board switch (A, fig. 30.1) and dimming knob.

38 (U). Trailer Mounted Director Station Miscellaneous Equipment

Miscellaneous equipment inside the trailer mounted director station consists of two blackout curtains, three pairs of 110-volt ac outlets (A, B, fig. 16), two fire extinguishers (B, fig. 16), a front escape hatch, (A, fig. 16), a side escape hatch (B, fig. 16), and four chairs (A, fig. 16). Miscellaneous equipment on the outside of the trailer mounted director station consists of three interconnecting boxes (B, fig. 16) and a siren.

a. The blackout curtains are made of grey cloth. One of the curtains is stored between the utility cabinet (A, fig. 16) and equipment cooling cabinet assembly, and the director station group. The second curtain is stored between the rear wall of the trailer-mounted director station and the computer amplifier-relay group (B, fig. 16). Each curtain is attached to a slide mounted in the ceiling of the trailer-mounted director station. Floor locks attached to the bottom of each curtain secure it to the floor when the curtain is fully extended.

b. Each of the three pairs of 110-volt ac outlets (A, B, fig. 16) is mounted near the floor of the trailer-mounted director station on the base of a cabinet. One of the pairs of outlets is at the base of the servo computer assembly (B, fig. (16), one pair at the base of the battery control console (A, fig. 16), and one pair at the base of the director station group. The outlets provide 110-volt ac power for test equipment, trouble lamps, and any accessory equipment requiring 110-volts ac power for operation.

c. One fire extinguisher (B, fig. 16) is beneath the side escape hatch on the roadside wall of the trailer-mounted director station. The other fire extinguisher is on the main entrance door at the rear of the trailer mounted director station.

d. Two escape hatches provide emergency exits. Each has a door which opens outward to

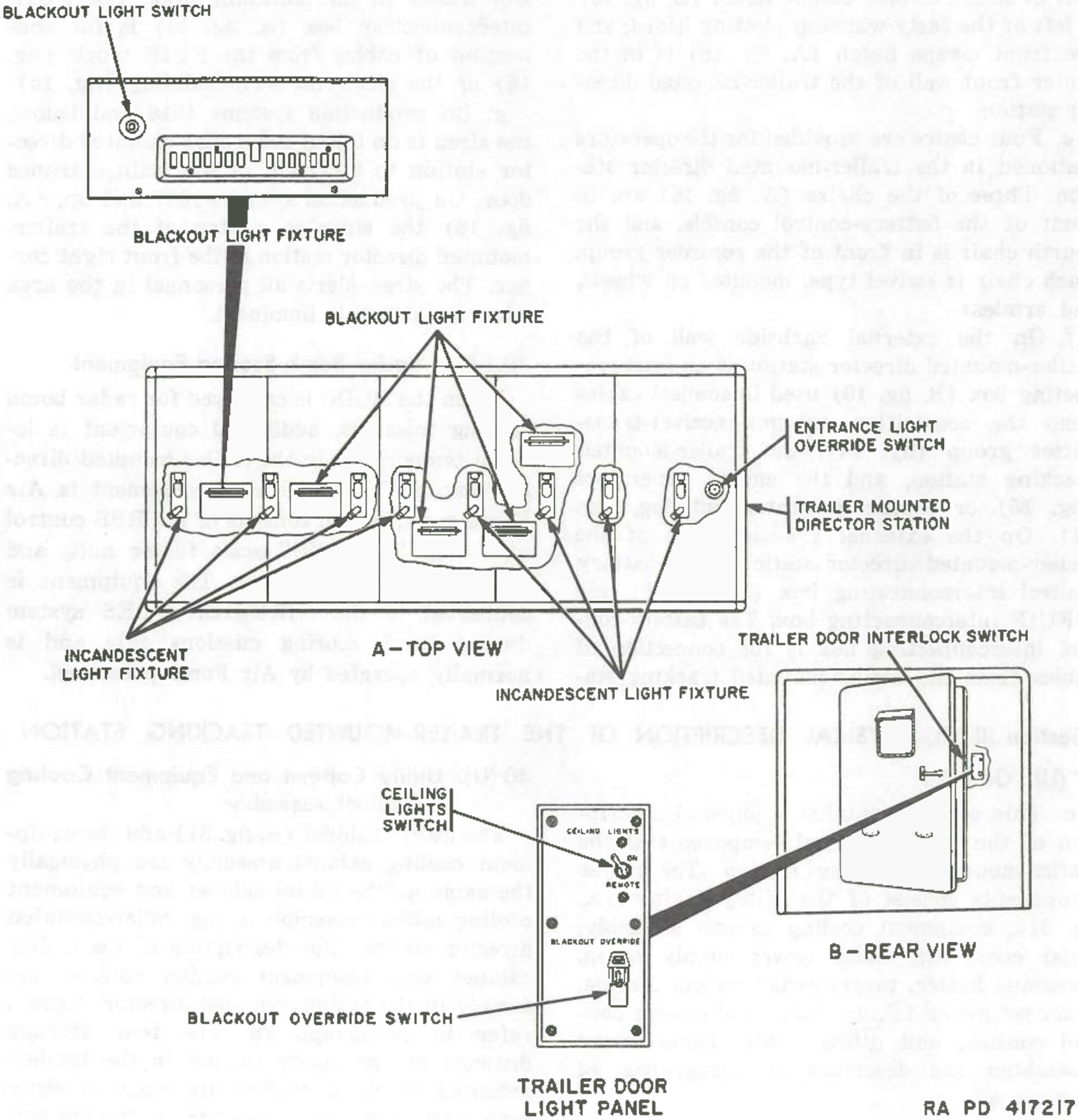


Figure 30 (U). Trailer-mounted director station—location of lighting equipment—systems 1186 and below.

provide an opening approximately 2 feet by 2 feet in size. The side escape hatch (B, fig. 16) is left of the early warning plotting board, and the front escape hatch (A, fig. 16) is in the center front wall of the trailer-mounted director station.

e. Four chairs are provided for the operators stationed in the trailer-mounted director station. Three of the chairs (A, fig. 16) are in front of the battery-control console, and the fourth chair is in front of the recorder group. Each chair is swivel type, mounted on wheels, and armless.

f. On the external curbside wall of the trailer-mounted director station is an interconnecting box (B, fig. 16) used to connect cables from the acquisition antenna-receiver-transmitter group (fig. 14), the trailer-mounted tracking station, and the engine generators (fig. 15) or engine generator building (fig. 14). On the external roadside wall of the trailer-mounted director station are a battery control interconnecting box (A, fig. 16) and a FUIF interconnecting box. The battery-control interconnecting box is for connection of cables from the trailer-mounted tracking station (figs. 14 and 15) and the launching control trailer in the launching area. The FUIF interconnecting box (A, fig. 16) is for connection of cables from the FUIF truck (fig. 15) or the electronic shop building (fig. 14).

g. On production systems 1016 and below, the siren is on top of the trailer-mounted director station to the right of the main entrance door. On production systems 1017 and up, (A, fig. 16) the siren is on top of the trailer-mounted director station at the front right corner. The siren alerts all personnel in the area when an attack is imminent.

38.1 (U). Radar Bomb Scoring Equipment

When the RCDC is employed for radar bomb scoring missions, additional equipment is located temporarily in the trailer-mounted director station. This additional equipment is Air Force materiel and consists of the RBS control unit (fig. 30.2), RBS scale factor unit, and communication equipment. The equipment is connected to the NIKE-HERCULES system during bomb scoring missions only and is normally operated by Air Force personnel.

Section III (U). PHYSICAL DESCRIPTION OF THE TRAILER-MOUNTED TRACKING STATION

39 (U). General

a. This section contains a physical description of the major internal components of the trailer-mounted tracking station. The major components consist of the utility cabinet (A, fig. 31), equipment cooling cabinet assembly, radar coder set, radar power supply group, personnel heater, target radar control console, radar set group (B, fig. 31), missile radar control console, and utility table. These major assemblies are described in paragraphs 40 through 47.

b. This section also contains a physical description of lighting equipment and various internal and external miscellaneous equipment of the trailer-mounted tracking station. A description of the lighting equipment and miscellaneous equipment is given in paragraphs 48 and 49 respectively.

40 (U). Utility Cabinet and Equipment Cooling Cabinet Assembly

The utility cabinet (A, fig. 31) and the equipment cooling cabinet assembly are physically the same as the utility cabinet and equipment cooling cabinet assembly in the trailer-mounted director station. For description of the utility cabinet and equipment cooling cabinet assembly in the trailer-mounted director station, refer to paragraph 28. The four storage drawers of the utility cabinet in the trailer-mounted tracking station are used to store tools and spare parts common to the trailer-mounted tracking station.

41 (U). Radar Coder Set

The radar coder set (A, fig. 31) is a cabinet on the curbside wall of the trailer-mounted tracking station. The top half of the radar coder set (fig. 32) contains electrical and elec-

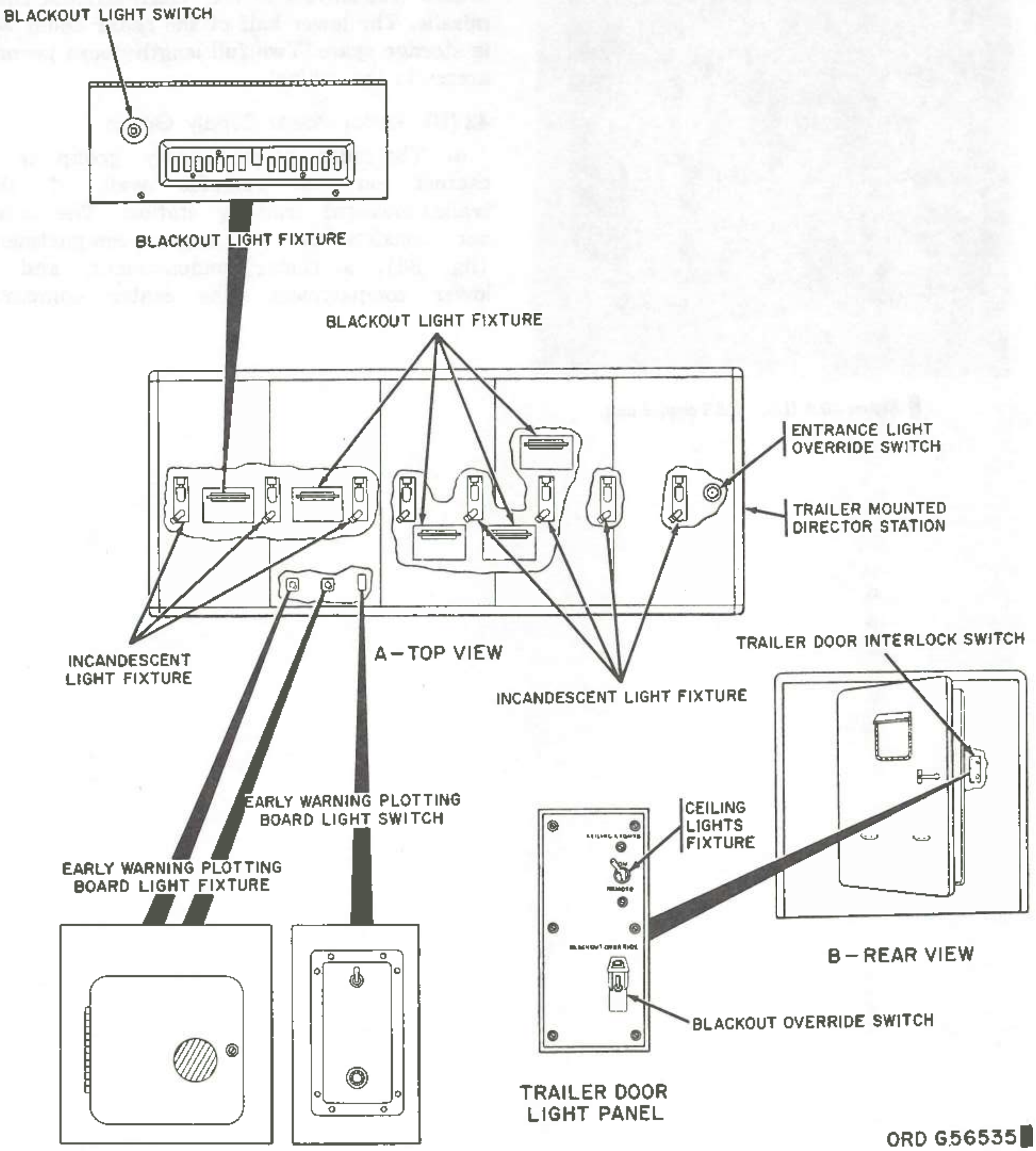
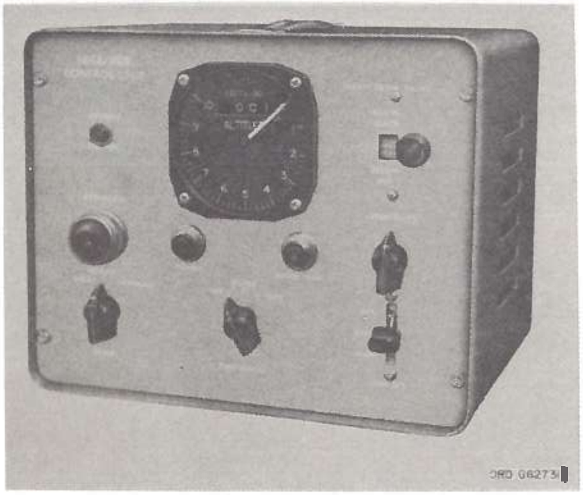


Figure 30.1 (U). Trailer-mounted director station—location of lighting equipment—systems 1187 and above.



▌*Figure 30.2 (U). RBS control unit.*

tronic equipment necessary for coding all orders transmitted to the NIKE-HERCULES missile. The lower half of the radar coder set is storage space. Two full length doors permit access to the cabinet.

42 (U). Radar Power Supply Group

a. The radar power supply group is a cabinet on the curbside wall of the trailer-mounted tracking station. The cabinet consists of an upper compartment (fig. 33), a center compartment, and a lower compartment. The center compart-

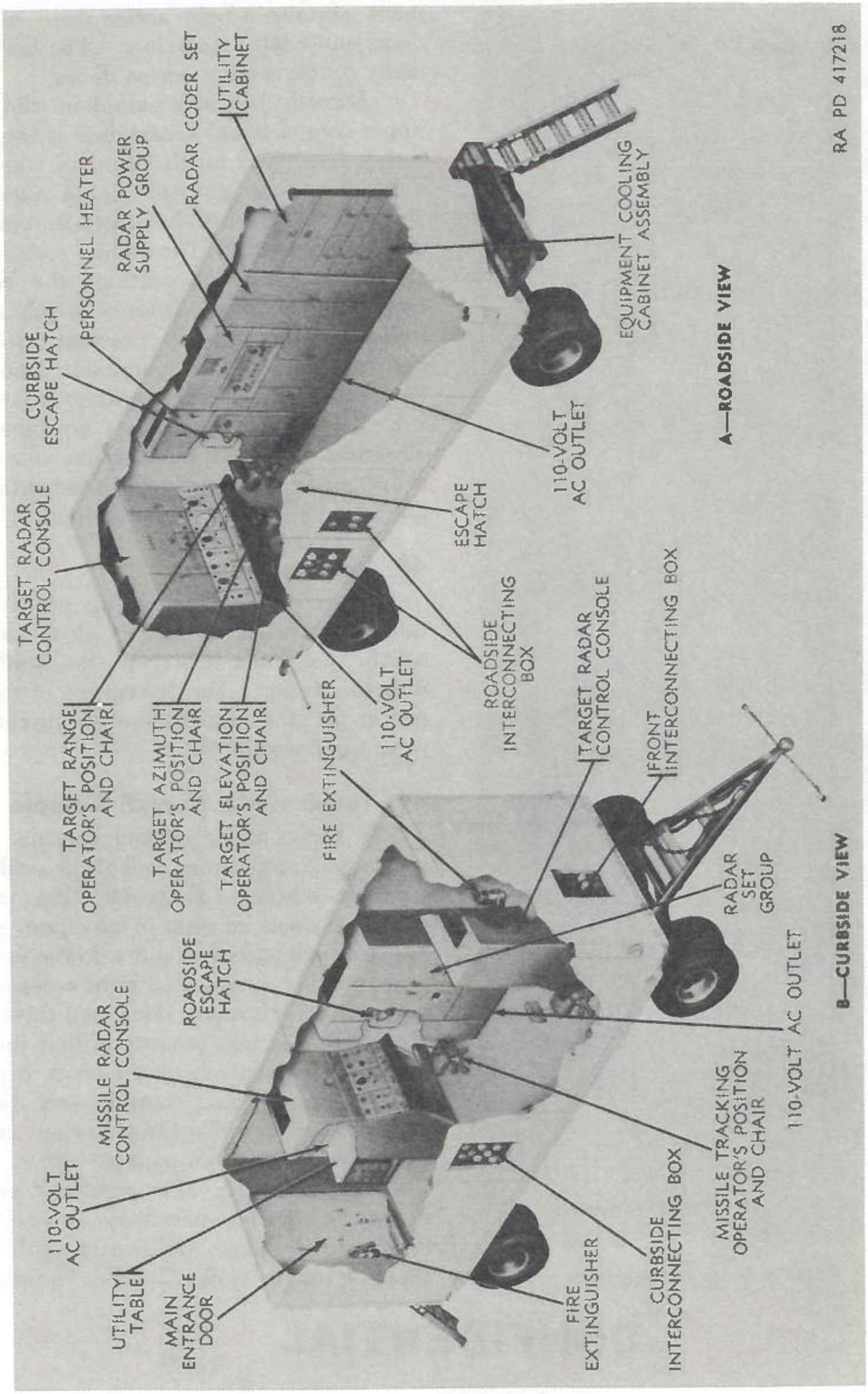


Figure 31. Trailer-mounted tracking station—cutaway views.

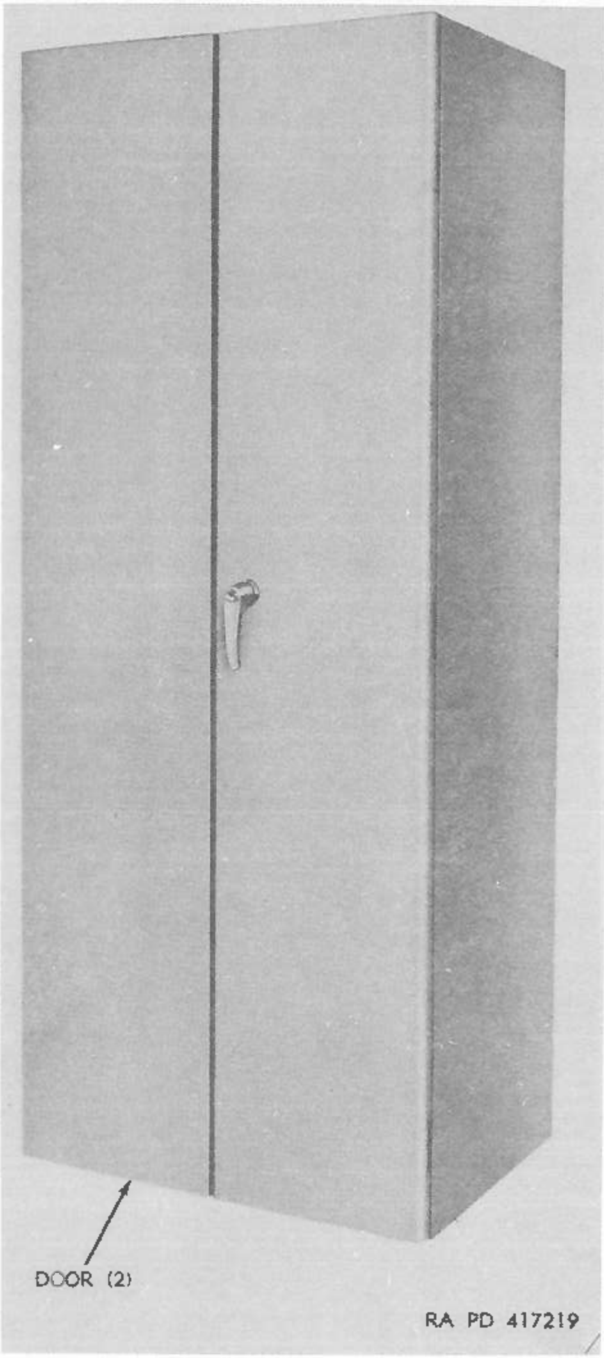


Figure 32. Radar coder set—oblique view.

ment contains a right access door, middle access door, and a left access door. The lower compartment contains three access doors.

b. Directly behind a cutout on the front of the upper compartment access door is the missile and target fuse panel on the front of which are fuses and blown-fuse indicator lights associated with the power supplies of the target- and missile-tracking radar systems. The middle access door to the center compartment contains the radar power control panel, on the front of which are controls, indicators, and meters necessary for operating and checking power equipment associated with the target- and missile-tracking radar systems.

c. Behind all access doors are power supplies, electrical panels, terminal strips, spare fuses, and other power equipment associated with the target- and missile-tracking radar systems.

43. Personnel Heater

The personnel heater (A, fig. 31) in the trailer-mounted tracking station is physically the same as the personnel heater in the trailer-mounted director station. For description of the personnel heater in the trailermounted director station, refer to paragraph 30.

44. Target Radar Control Console

The target radar control console (A, fig. 31) is a cabinet on the front wall of the trailer-mounted tracking station. Externally the target radar control console consists of an upper section (fig. 34), a middle section, and a lower section. The upper section consists of a right access door, center access door, left access door, and three indicators. The middle section consists of four indicators, an electric light control, target track control power supply, target test control, and target track control drawer. The lower section consists of a work counter and two panels.

a. Upper Section. The right and center access doors swing open to permit access to electrical and electronic equipment associated with the target-tracking radar system. Four equipment status

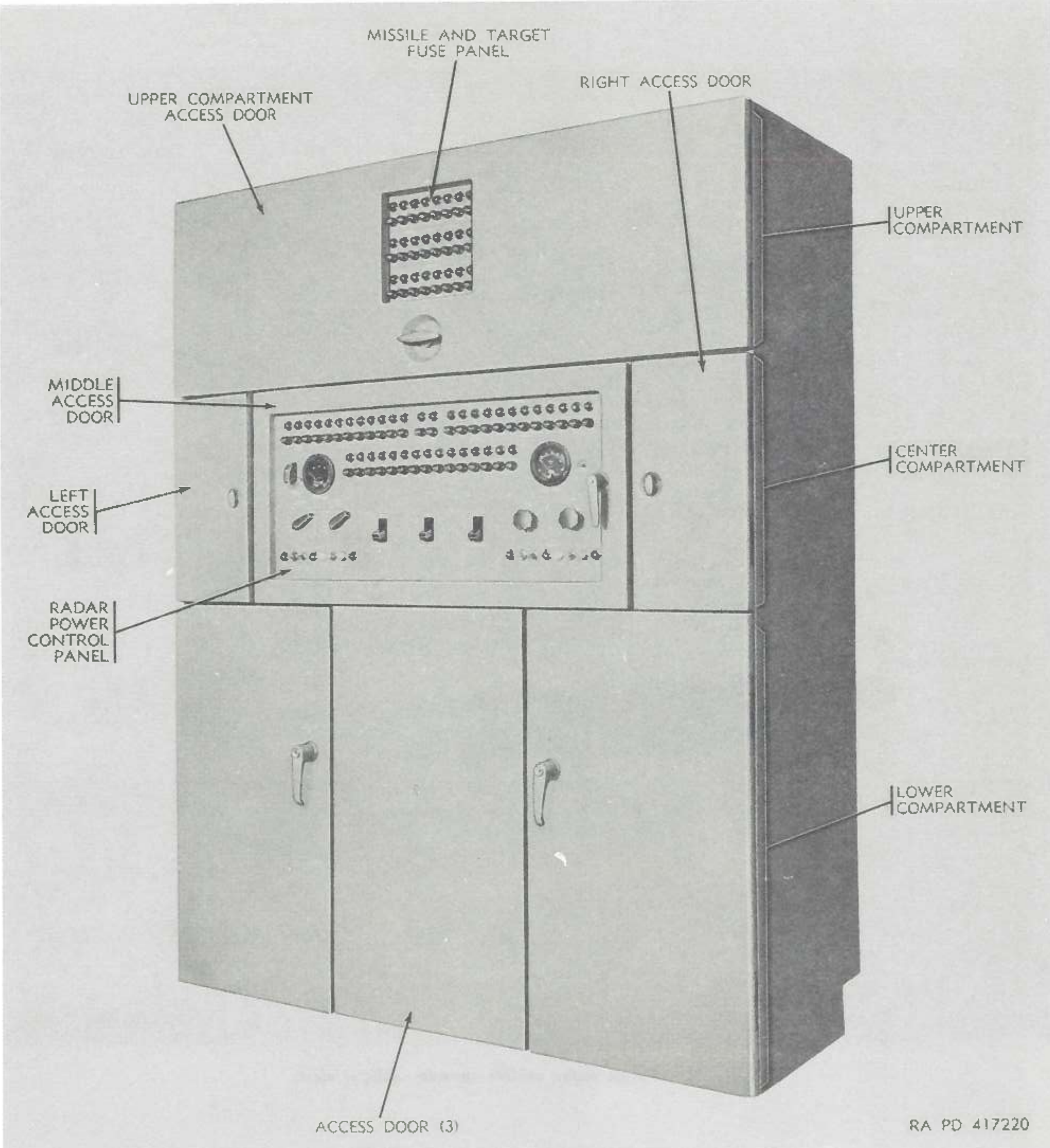


Figure 33. Radar power supply group—oblique view.

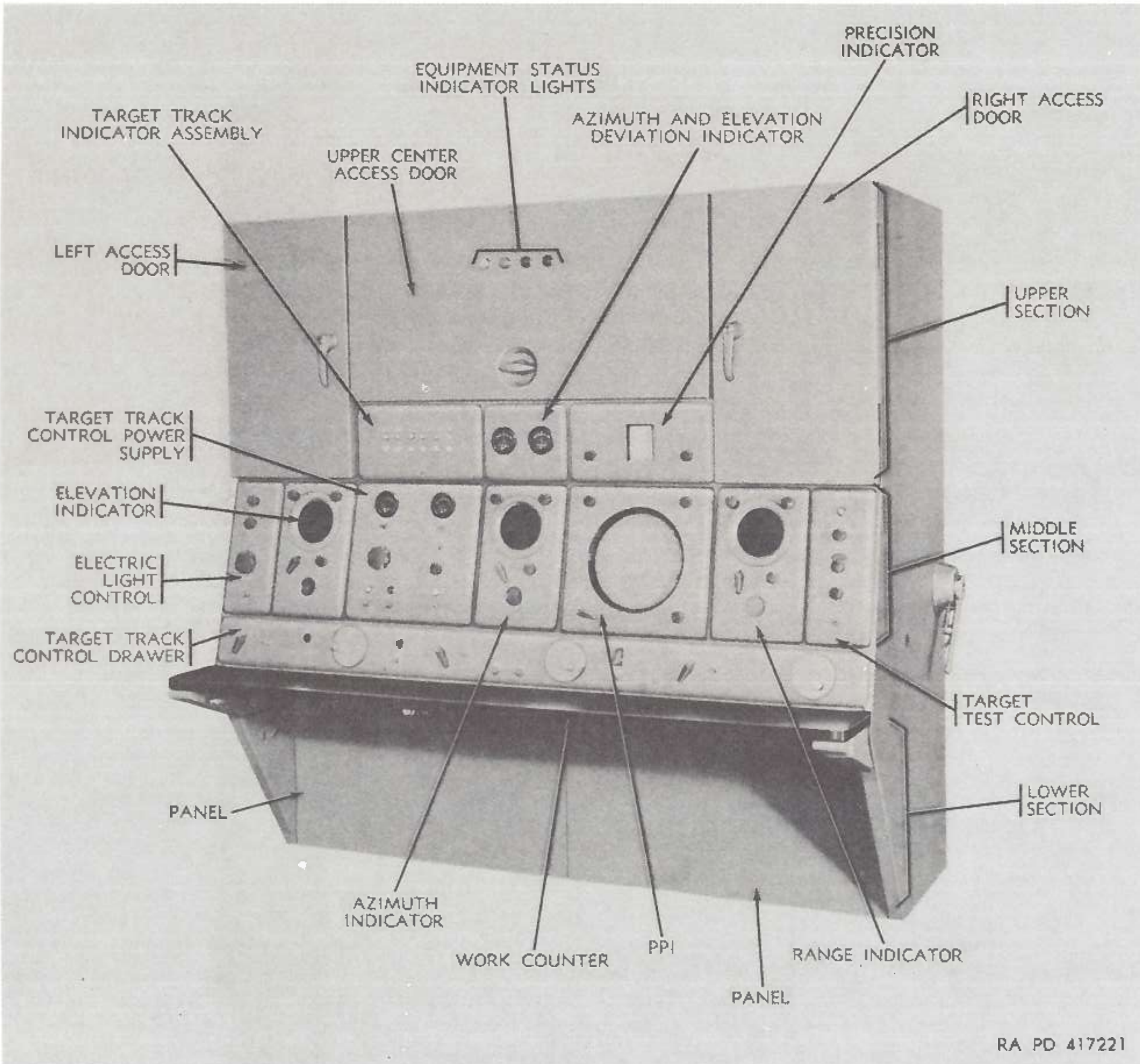


Figure 34. Target radar control console—oblique view.

indicator lights are located on the front of the center access door. The left access door swings open to provide storage space. The precision indicator is associated with the presentation system of the acquisition radar system but is for the use of the target track operators. The front panel of the azimuth and elevation deviation indicator contains meters associated with the target-tracking radar system. The front panel of the target track indicator assembly contains indicator lights associated with the tactical control of the NIKE-HERCULES System.

b. Middle Section. The PPI is associated with the presentation system of the acquisition radar system, but provides information for the use of the target track operators. The azimuth indicator, the elevation indicator, and the range indicator are associated with the azimuth, elevation, and range presentation circuits respectively of the target-tracking radar system. The front panel of the target track control power supply contains controls, indicators, and meters necessary for operation of the power circuits associated with the target-tracking radar system. The electric light control consists of controls necessary for operation of the trailer-mounted tracking station ceiling lights, and dial and signal lights on the target radar control console. The front panel of the target test control consists of controls, an indicator, and a dial necessary for operation of the radar test set TS–847A/MSW–1 (fig. 53). The front panel of the target track control drawer contains controls and indicators necessary for tracking operations associated with target-tracking radar system.

c. Lower Section. The work counter is provided for convenience of the target-tracking operators. The two panels beneath the work counter provide access to electrical equipment consisting primarily of terminal boards.

d. Operators' Positions. Three operators' positions are provided at the target radar control console (A, fig. 31). The target azimuth operator's position is in front of the azimuth indicator (fig. 34) in the center of the target radar control console; the target elevation operator's position (A, fig. 31) is left of the azimuth operator's position, in front of the elevation indicator (fig. 34); and the target range operator's position (A, fig. 31) is right of the azimuth operator's position, in front of the range indicator (fig. 34). Each operator is positioned in front of the equipment associated with the operations for which he is responsible.

45. Radar Set Group

The radar set group (B, fig. 31) is a cabinet on the roadside wall of the trailer-mounted tracking station. Externally, the radar set group (fig. 35) consists of four access doors. The middle access door provides access to electrical and electronic equipment associated with the operation of the missile-tracking radar system. The right access door provides access to electrical and electronic equipment associated with the operation of the target-tracking radar system. The right and middle access doors each have a glass aperture for viewing dials associated with the equipment behind each door. The lower access door permits access to terminal strips. The left access door permits access to 17 electrical equipment panels associated with the launcher-selection operation of the missile-tracking radar system.

46. Missile Radar Control Console

The missile radar control console (B, fig. 31) is on the roadside wall of the trailer-mounted tracking station. Externally the missile radar control console (fig. 36) consists of an upper section, a middle section, and a lower section. The upper section consists of an access door and the missile control-indicator group. The middle section consists of the missile track indicator, range indicator, missile track control power supply, and the missile track control drawer. The lower section consists of a work counter and a panel.

a. Upper Section. The access door swings upward to permit access to electrical and elec-

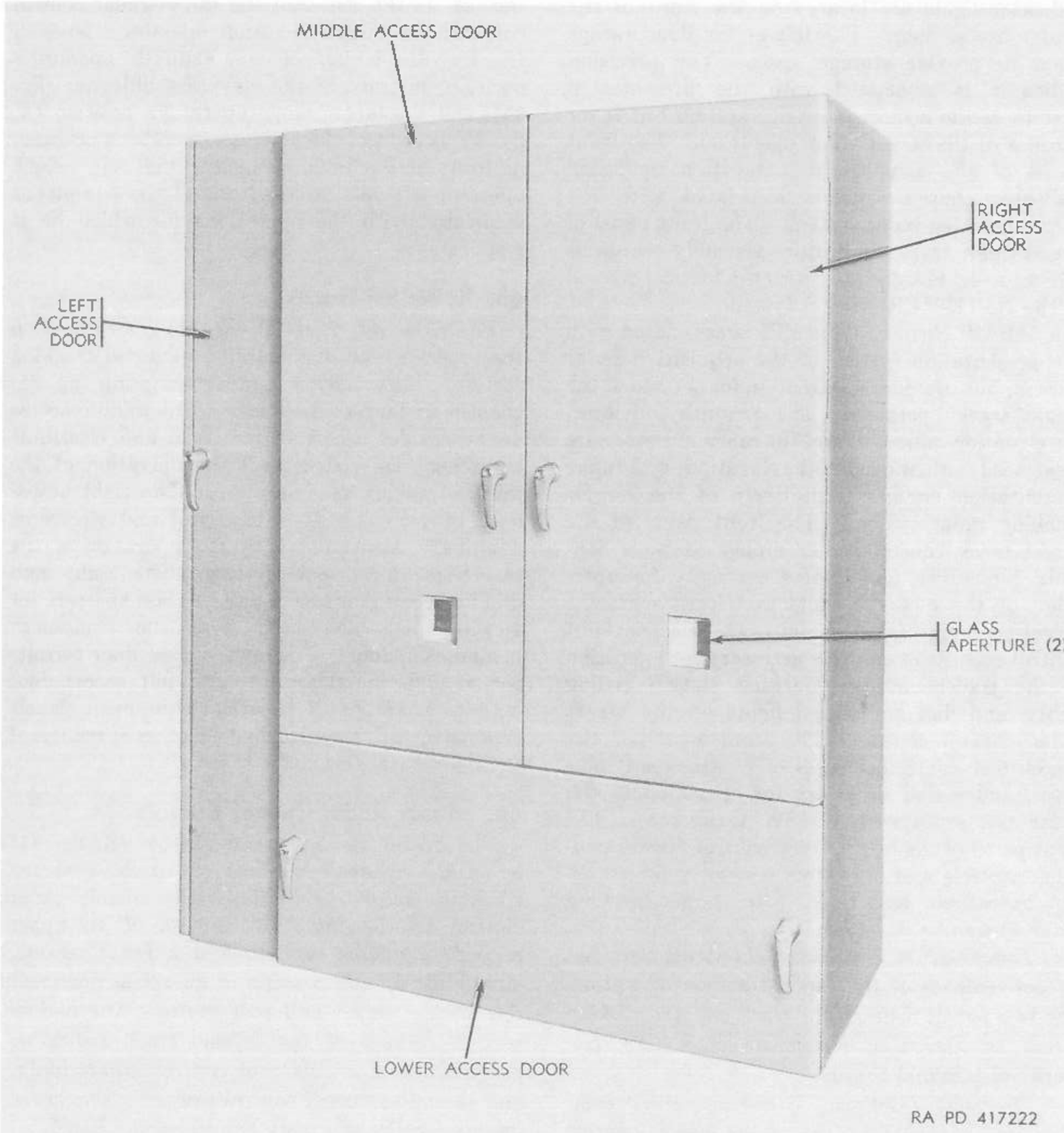


Figure 35. Radar set group—oblique view.

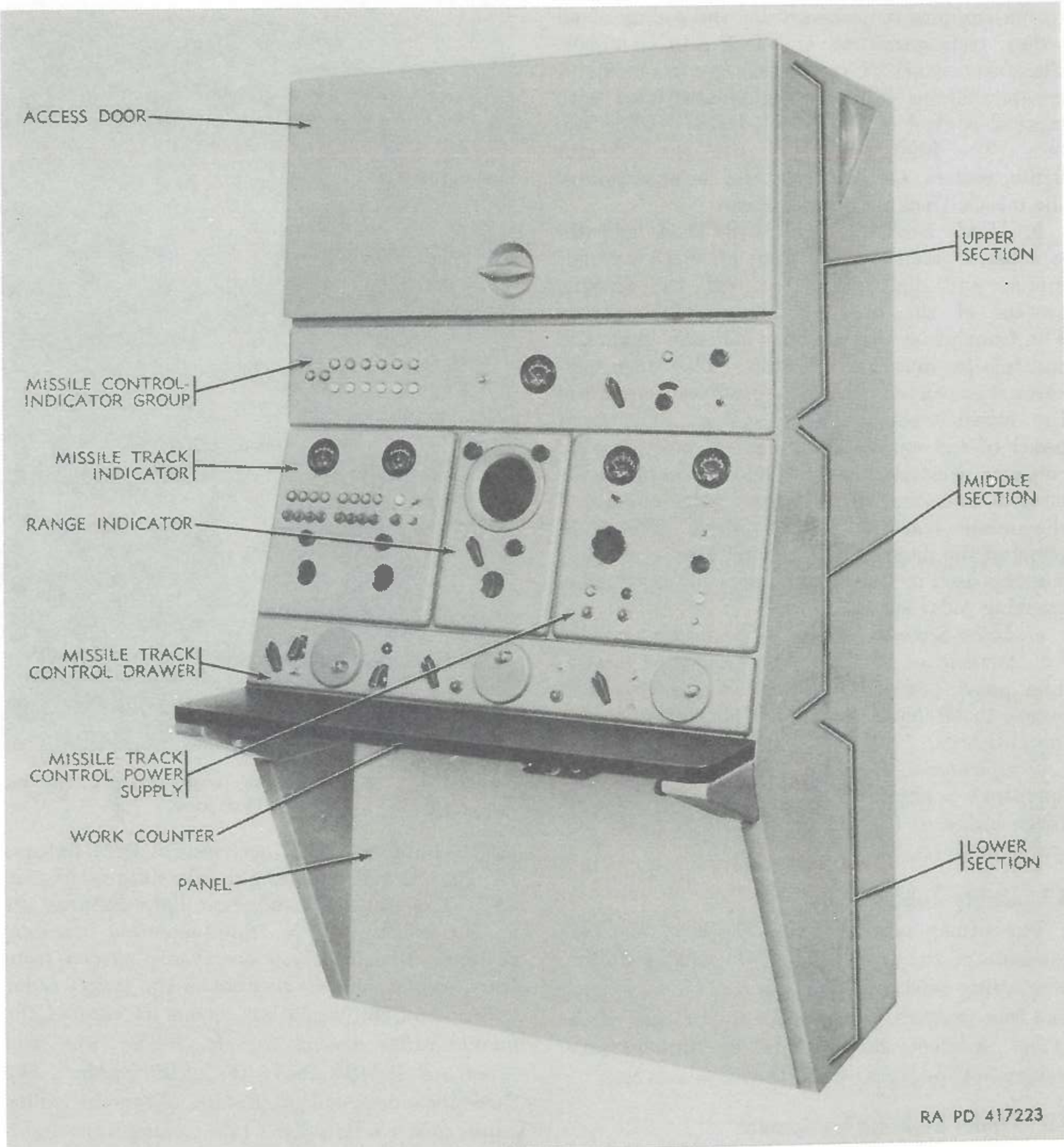


Figure 36. Missile radar control console—oblique view.

tronic equipment necessary for the coding of all orders transmitted to a NIKE-AJAX missile. The front panel of the missile control-indicator group contains indicator lights associated with tactical control of the NIKE-HERCULES System. The front panel also contains indicator lights, meters, and controls used in operation of the missile-tracking radar system.

b. Middle Section. The missile track indicator is a panel assembly, the front of which contains meters and dials associated with the antenna system of the missile-tracking radar system. The front panel also contains indicator lights and controls for launcher selection. The range indicator is associated with the presentation circuits of the missile-tracking radar system. The front panel of the missile track control power supply contains controls, meters, and indicator lights used in operation of the high-voltage circuits of the missile-tracking radar system. The front panel of the missile track control drawer contains controls used in testing and operating the missile-tracking radar system.

c. Lower Section. The work counter is provided for convenience of the missile-tracking operator. The panel beneath the work counter provides access to electrical equipment consisting of terminal boards.

d. Operator's Position. The missile-tracking operator's position (B, fig. 31) is in front of the range indicator (fig. 36) on the missile radar control console (B, fig. 31).

47. Utility Table

The utility table (B, fig. 31) is at the rear roadside of the trailer-mounted tracking station. The utility table (fig. 37) consists of a workbench and four drawers, mounted on the left side of the table. A stool, mounted to the utility table, swings out for access when the table is in use.

48. Trailer Lighting Equipment

a. The trailer-mounted tracking station is internally lighted by means of 19 incandescent

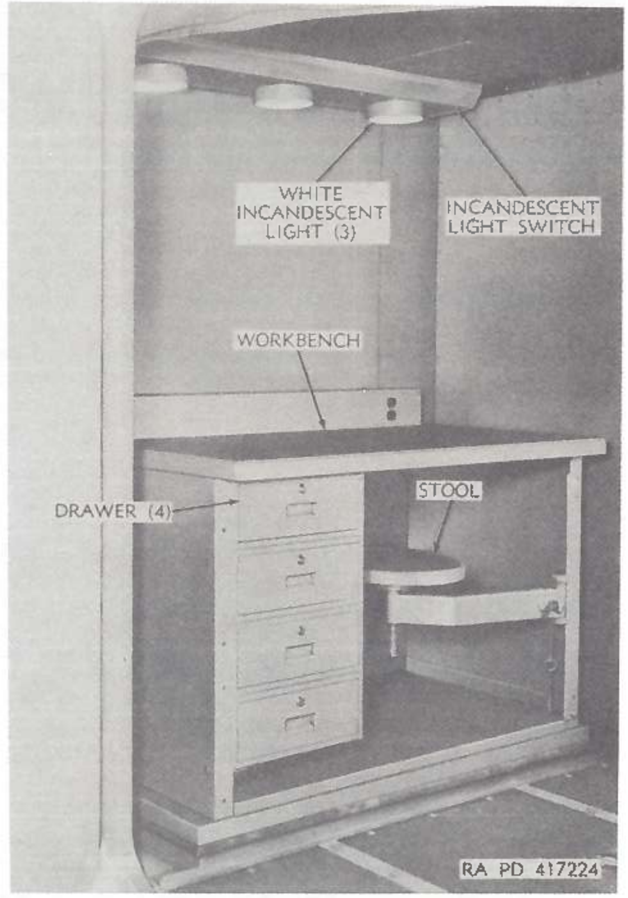


Figure 37. Utility table in trailer-mounted tracking station—oblique view.

lights contained in 11 incandescent light fixtures (A, fig. 38) and 4 blacklight light fixtures (A, fig. 38). The eleven incandescent light fixtures are in the ceiling of the trailer-mounted tracking station. Five of these are evenly spaced from front to rear, two are in front of the target radar control console (A, fig. 31), one is in front of the missile radar control console (B, fig. 31), and three are directly above the utility table. The three incandescent light fixtures above the utility table each contain one white incandescent light. Six of the remaining incandescent light fixtures each contain a white incandescent light, a blue

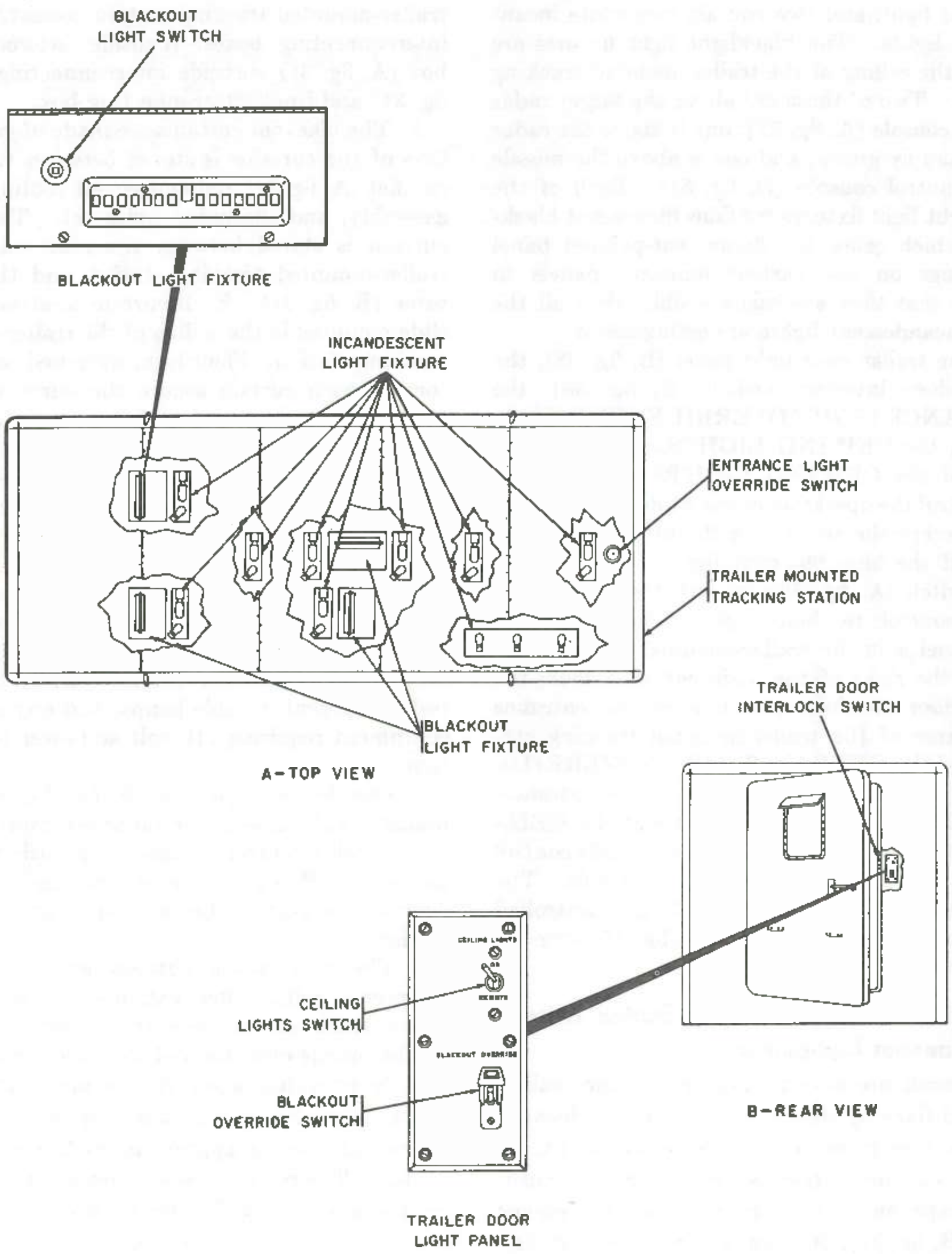


Figure 38. Trailer-mounted tracking station—location of lighting equipment.

blackout light, and two contain two white incandescent lights. The blacklight light fixtures are also in the ceiling of the trailer-mounted tracking station. Two of these are above the target radar control console (A, fig. 31); one is above the radar power supply group; and one is above the missile radar control console (B, fig. 31). Each of the blacklight light fixtures contains fluorescent blacklights which cause the fluorescent-painted panel engravings on the various indicator panels to glow so that they are easily visible when all the white incandescent lights are extinguished.

b. The trailer door light panel (B, fig. 38), the trailer door interlock switch (B, fig. 38), the ENTRANCE LIGHT OVERRIDE SWITCH (A, fig. 38), the CEILING LIGHTS switch (D, fig. 97), and the CEILING LIGHTS knob (C, fig. 97) control the operation of the white incandescent lights except the three over the utility table (fig. 37), and the blue blackout lights. A blacklight light switch (A, fig. 38) on each blacklight light fixture controls the black lights. The trailer door light panel is in the trailer-mounted tracking station to the right of the main entrance door; the trailer door interlock switch is on the entrance door frame of the trailer-mounted tracking station; and the ENTRANCE LIGHT OVERRIDE SWITCH is in the ceiling above the main entrance. The CEILING LIGHTS switch and the CEILING LIGHTS knob are on the electric light control (fig. 34) on the target radar control console. The three incandescent lights (fig. 37) are controlled by the incandescent light switch (fig. 37) over the utility table.

49. Trailer-Mounted Tracking Station Miscellaneous Equipment

a. Miscellaneous equipment inside the trailer-mounted tracking station consists of two blackout curtains, four pairs of 110-volt ac outlets (A, B, fig. 31), two fire extinguishers (B, fig. 31), curbside escape hatch (A, fig. 31), roadside escape hatch (B, fig. 31), and four chairs (A, B, fig. 31). Miscellaneous equipment on the outside of the trailer-mounted tracking station consists of three interconnecting boxes: roadside interconnecting box (A, fig. 31) curbside interconnecting box (B, fig. 31) and front interconnecting box.

b. The blackout curtains are made of grey cloth. One of the curtains is stored between the utility cabinet (A, fig. 31) and equipment cooling cabinet assembly, and the radar coder set. The second curtain is stored between the rear wall of the trailer-mounted tracking station and the utility table (B, fig. 31). Each curtain is attached to a slide mounted in the ceiling of the trailer-mounted tracking station. Floor locks attached to the bottom of each curtain secure the curtains to the floor when the curtains are fully extended.

c. Three of the four pairs of 110-volt ac outlets are mounted near the floor of the trailer-mounted tracking station at the base of a cabinet. One pair of outlets is at the base of the radar power supply group (A, fig. 31), one pair is at the base of the target radar control console (B, fig. 31), and one pair is at the base of the radar set group (B, fig. 31). The fourth outlet is on the utility table. The outlets provide 110-volt ac power for test equipment, trouble lamps, and any accessory equipment requiring 110-volt ac power for operation.

d. One fire extinguisher (B, fig. 31) is on the roadside wall between the radar set group and the target radar control console. The other fire extinguisher (B, fig. 31) is on the main entrance door at the rear of the trailer-mounted tracking station.

e. The two escape hatches are provided as emergency exits. Observation of the missile and target track antenna-receiver-transmitter groups by the missile operator and the target range operator is provided when the escape hatches are open. Each has a door which opens outward to provide an opening approximately 2 feet by 2 feet in size. The roadside escape hatch (A, fig. 31) is on the roadside wall between the missile radar control console and the radar set group. The curbside escape hatch (A, fig. 31) is on the curbside wall between the target radar control console and the personnel heater.

f. Four chairs are provided for the operators stationed in the trailer mounted tracking station. Three of the chairs (A, fig. 31) are in front of the target radar control console, and the fourth chair (B, fig. 31) is in front of the missile radar control console. Each chair is swivel type, mounted on rollers, and armless.

g. On the external curbside wall of the trailer mounted tracking station is the curbside interconnecting box (B, fig. 31) for connection of cables from the missile and target track antenna-receiver-transmitter groups (fig. 14), the trailer mounted director station, the engine generator, and the radar test set TS-847A/MSW-1. On the front external wall of the trailer mounted tracking station is the front interconnecting box (B, fig. 31) for connection of cables from target track antenna-receiver-transmitter group (fig. 14) and the trailer mounted director station. On the external roadside wall of the trailer mounted tracking station is the roadside interconnecting box (A, fig. 31) for connection of cables from the missile and target track-antenna-receiver-transmitter groups (fig. 14) and the trailer mounted director station.

Section IV (U). PHYSICAL DESCRIPTION OF THE ACQUISITION ANTENNA-RECEIVER-TRANSMITTER GROUP, AND THE TRAILER MOUNTED MISSILE AND TARGET TRACK ANTENNA-RECEIVER-TRANSMITTER GROUPS.

50 (U). Acquisition Antenna-Receiver-Transmitter Group

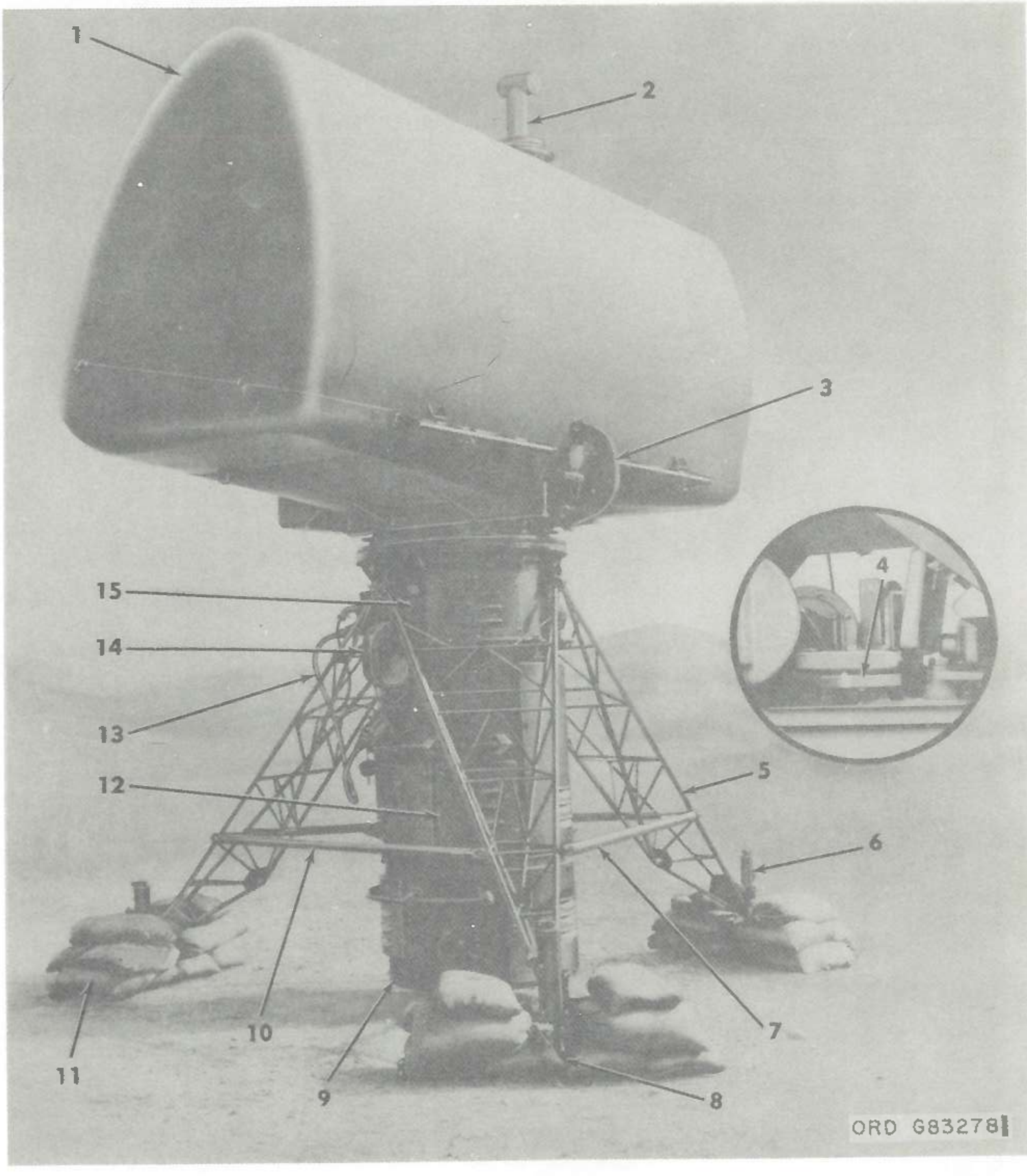
a. The acquisition antenna-receiver-transmitter group (fig. 39) is olive drab in color, 13½ feet high, and weighs approximately 2,500 pounds. The acquisition antenna-receiver-transmitter group consists of the following major components: acquisition modulator (fig. 39), acquisition receiver-transmitter, acquisition antenna pedestal, acquisition antenna, three antenna pedestal legs, an acquisition orientation level, identification friend or foe (IFF) antenna (fig. 40), and the IFF receiver-transmitter and coder. The acquisition antenna-receiver-transmitter group (fig. 39.1) is modified to include an auxiliary antenna subassembly for those NIKE-HERCULES systems with anti-jam display (AJD) capabilities. External cables (fig. 39), a flexible waveguide, and a stationary waveguide permit interconnection of the above major components.

b. The acquisition modulator (fig. 41) is tub-shaped and is approximately 27 inches high and 41 inches in diameter. The acquisition modulator contains high voltage and pulse generating equipment associated with the transmitter system of the acquisition radar system. An access panel (A, fig. 41) on the acquisition modulator provides access to thiis internal equipment. Four external connectors (A, B, fig. 41) are provided for connection of cables. A handling bar (A, fig. 41) is provided for ease of handling when the acquisition modulator is separated from the remainder of the acquisition antenna-receiver-transmitter group. Two filter access covers (A, B, fig. 41) permit changing or cleaning the filters behind each cover.

c. Acquisition receiver-transmitter is tub-shaped (fig. 42) and is approximately 43 inches high and 41 inches in diameter. The acquisition receiver-transmitter contains primarily receiving and transmitting equipment associated with the receiver system and transmitter system of the acquisition radar system. Two access panels (B, fig. 42) and a combination access panel and filter access cover (A, fig. 42) provide access to this internal equipment. Various external connectors (A and B, fig. 42) are provided for connection of cables. Handling bars permit ease of handling when the acquisition receiver-transmitter is separated from the remainder of the acquisition antenna-receiver-transmitter group. Two filter access covers and the combination access panel and filter access cover (A, fig. 42) permit changing or cleaning the filters behind each cover.

d. The acquisition antenna pedestal (fig. 43) is tub-shaped, and is approximately 20 inches high and 41 inches in diameter. It houses the acquisi-

Figure 39 (U). Acquisition antenna-receiver-transmitter group—overall view.



1—Acquisition antenna
2—Auxiliary antenna subassembly
3—Stationary waveguide
4—Acquisition orientation level
5—Antenna pedestal leg
6—Leveling jack
7—Horizontal cross bar
8—Round metal disk
9—Acquisition modulator
10—Cross bars
11—Sandbags
12—Acquisition receiver-transmitter
13—External cables
14—Flexible waveguide
15—Acquisition antenna pedestal

Figure 39.1 (U). Acquisition antenna-receiver-transmitter group, systems with AJD capabilities—overall view.

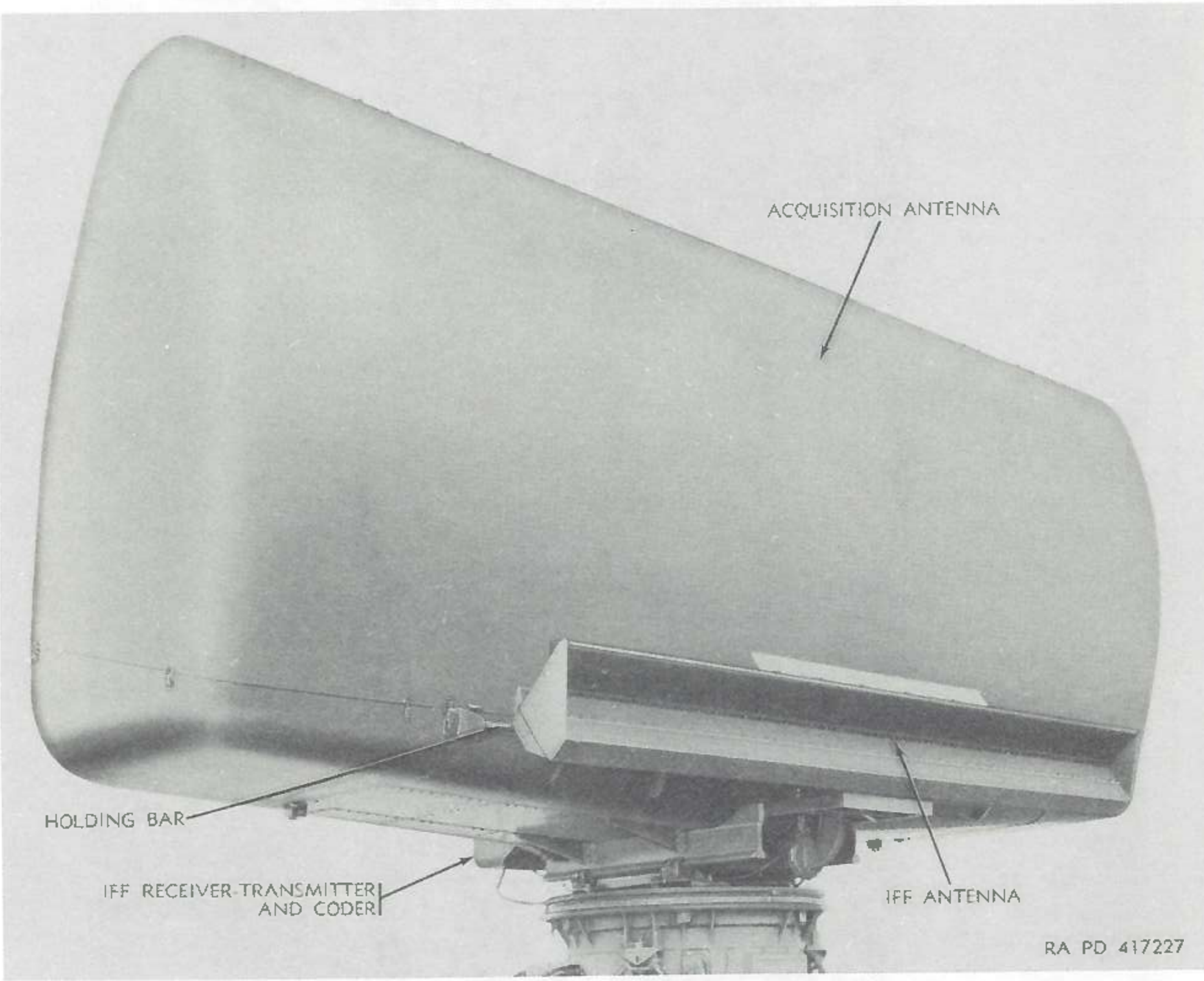


Figure 40. Acquisition antenna-receiver-transmitter group—partial view.

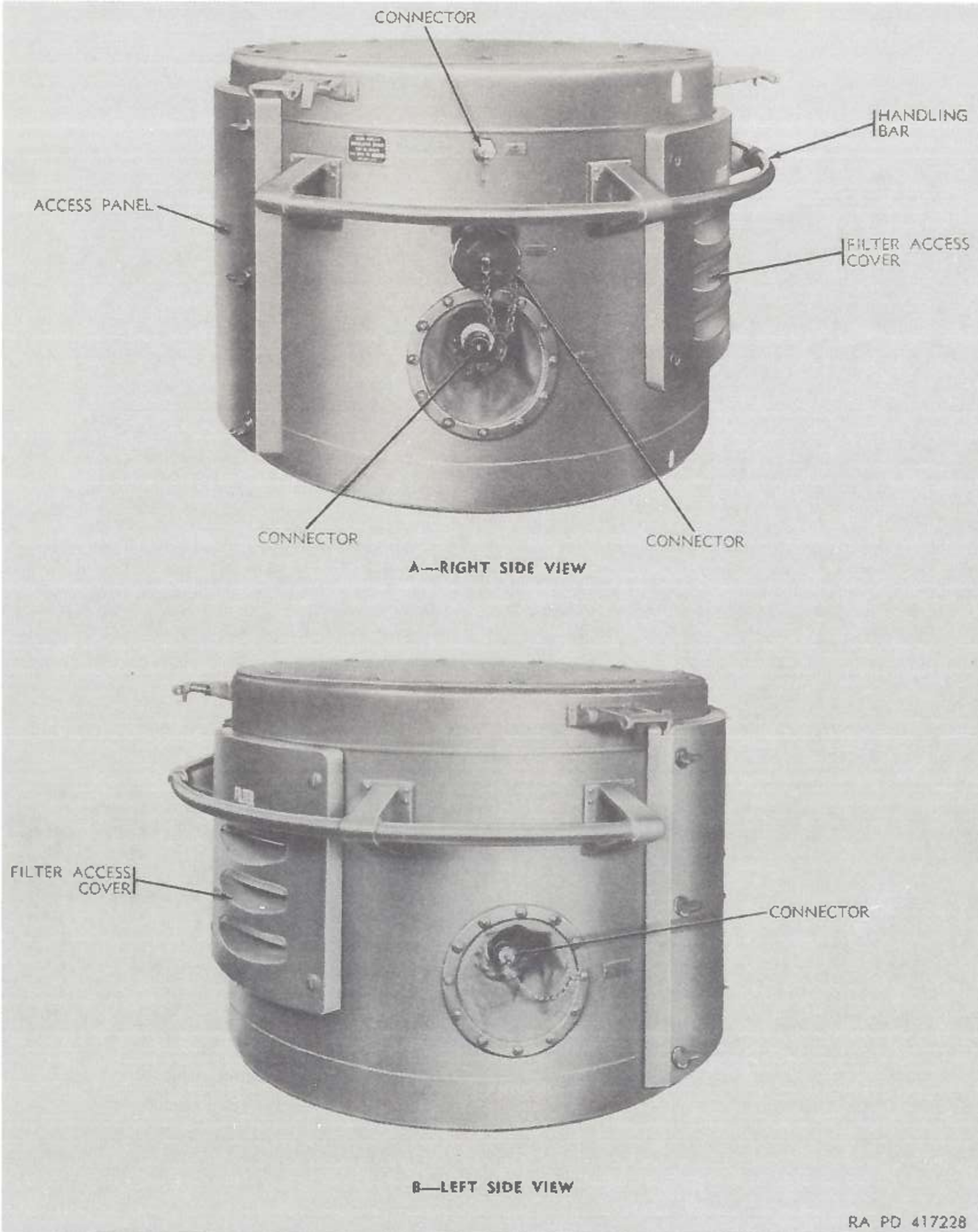


Figure 41. Acquisition modulator.

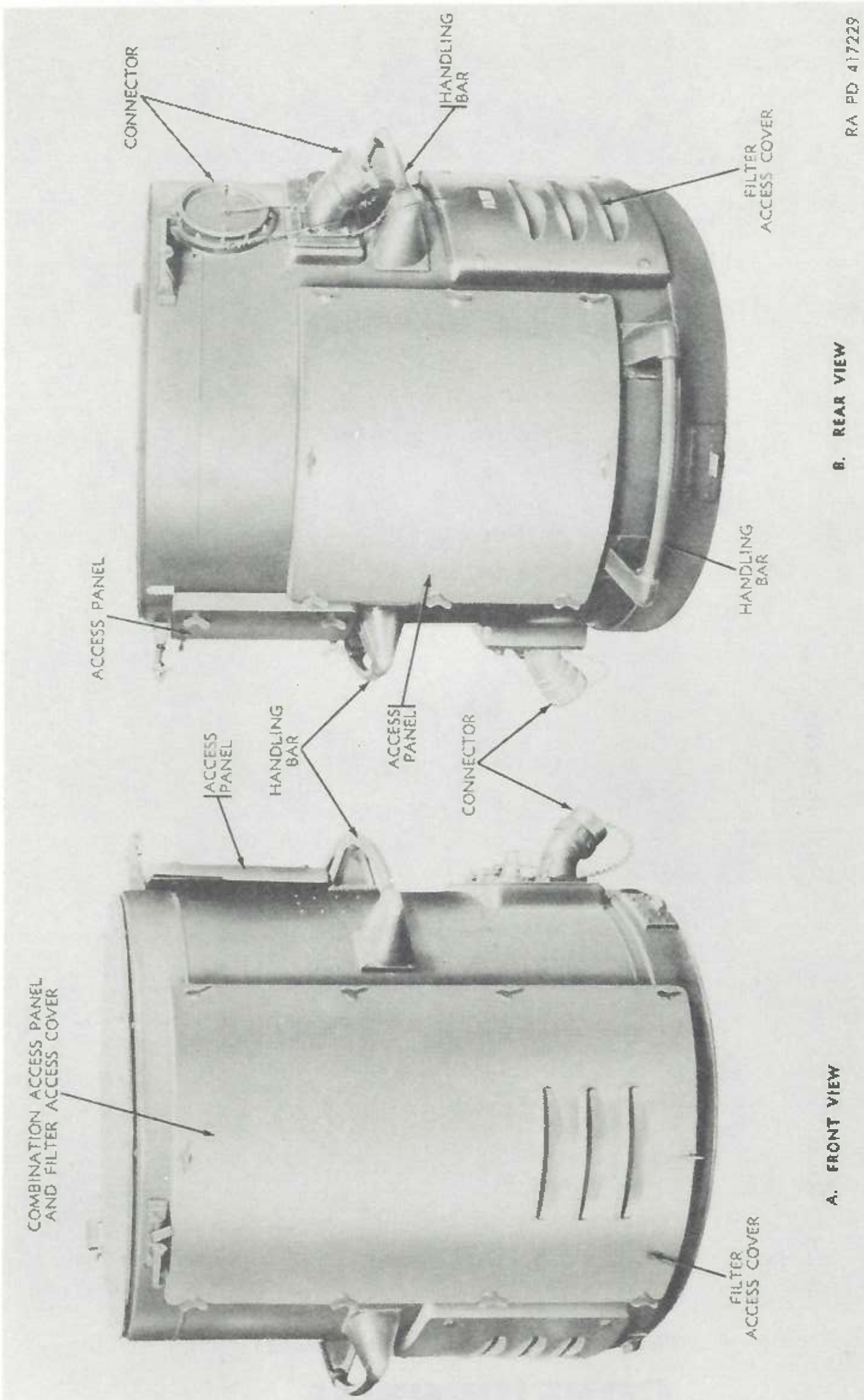


Figure 42. Acquisition receiver-transmitter.

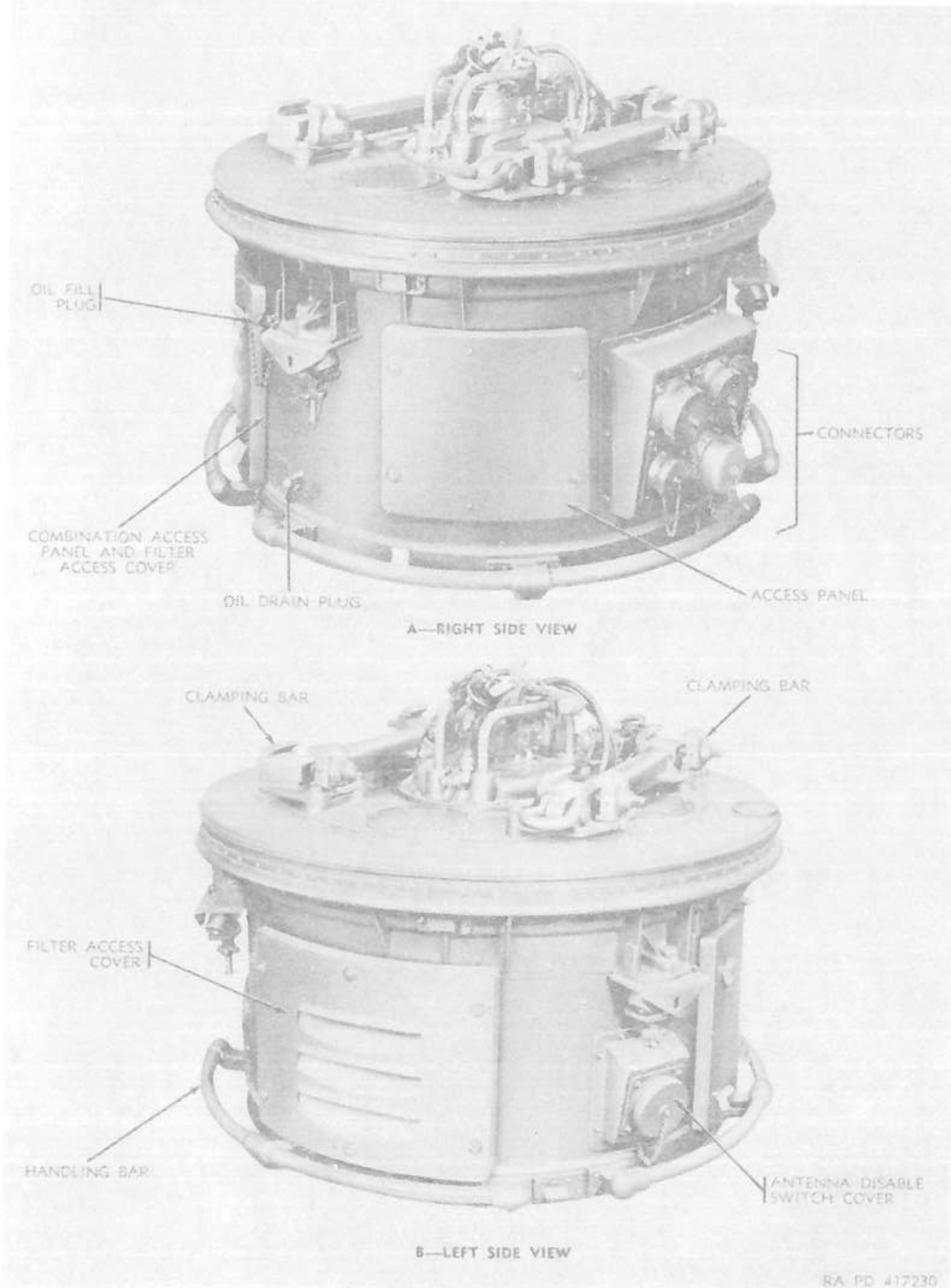


Figure 43. Acquisition antenna pedestal.

tion antenna drive equipment and other electrical equipment necessary for coupling radio frequency energy and various electrical signals to and from the rotating acquisition antenna. An access panel (A, fig. 43) and a combination access panel and filter access cover provide access to all internal equipment. Five external connectors (A, fig. 43) are provided for connection of cables. An antenna disable switch cover (B, fig. 43) provides access to the antenna disable switch. An OIL FILL plug (A, fig. 43) and an OIL DRAIN plug are externally located. A handling bar (B, fig. 43) permits ease of handling when the acquisition antenna pedestal is separated from the remainder of the acquisition antenna-receiver-transmitter group. A filter access cover and the combination access panel and filter access cover (A, fig. 43) permit changing or cleaning the filters behind each cover. Two clamping bars (B, fig. 43) connect the acquisition antenna to the acquisition antenna pedestal.

e. The acquisition antenna (fig. 44) is approximately 15 feet in length, 6¼ feet in height, and 5 feet in width. A fiberglas radome connected to an antenna base assembly covers the internal reflectors and associated equipment. Antenna tracks connect the acquisition antenna to the acquisition antenna pedestal.

f. Three antenna pedestal legs (fig. 39), constructed of tubular steel, help support the acquisition antenna-receiver-transmitter group. The cross-member type design of each leg provides maximum structural support. Horizontal crossbars attached from each leg to the other provide extra support. Attached to each leg is a leveling jack. The base of each leveling jack is a round metal disk, on which two crossbars are mounted. Sandbags placed on the crossbars of each jack insure its stable emplacement.

g. The acquisition orientation level (fig. 39) is on top of the acquisition antenna pedestal and directly beneath the acquisition antenna. It is in a case (fig. 45) approximately 5 inches wide, 7 inches long, and 1½ inches high. Two levels in the case are positioned at 90 degrees to one another. Two sighting bars, each swivel-mounted at opposite ends of the base plate, may be raised or lowered as needed. The levels are used for leveling the acquisition antenna. The sighting bars are used to orient the acquisition antenna azimuth positioning circuits with respect to the position of the acquisition antenna.

g.1. The auxiliary antenna subassembly (fig. 39.1) is mounted on top of the acquisition antenna and rotates in synchronism with it. The auxiliary antenna subassembly is a modified yagi consisting of a driven dipole and nine parasitic elements. This antenna is designed for receiving only.

Note. The key numbers shown in parentheses in *g.2* below refer to figure 45.1 unless otherwise indicated.

g.2. For systems with AJD capabilities, the level assembly (4) normally will be stored in the antenna case in the trailer mounted electronic shop (fig. 15) on semimobile sites or in the electronic shop building (13, fig. 14) on permanent sites. The level assembly (4) is attached to the auxiliary antenna support with level mounting screws (3). Two levels (5) are positioned at 90 degrees to one another. Two socket head screw wrenches (6) are mounted on the level assembly (4). Four leveling screws (8) are provided to level the auxiliary antenna support. Two azimuth orientation sights (2) are mounted on the auxiliary antenna subassembly (1). Four azimuth orientation locking screws (9) are provided to allow orientation of the auxiliary antenna. The rf transmission line (7) couples the rf energy from the auxiliary antenna subassembly (1) to the acquisition antenna pedestal (15, fig. 39.1). The levels (5) are used for leveling the auxiliary antenna subassembly (1). The azimuth orientation sights (2) are used to orient the auxiliary antenna (1) with respect to the position of the acquisition antenna (1, fig. 39.1).

h. The identification friend or foe (IFF) antenna (fig. 40) is attached to a holding bar on the lower portion of the acquisition antenna. The receiver-transmitter RT-211A/TPX and coder-control unit KY-97B/TPX (fig. 46) is centrally located on the opposite side of the acquisition antenna from the IFF antenna. The recognition signal simulator SM-140-TPX mounted on the receiver transmitter, is used for testing purposes only. The IFF antenna and receiver-transmitter and coder-control unit comprise the major components of the MARK 10 SIF/IFF system, which is associated with the acquisition radar system.

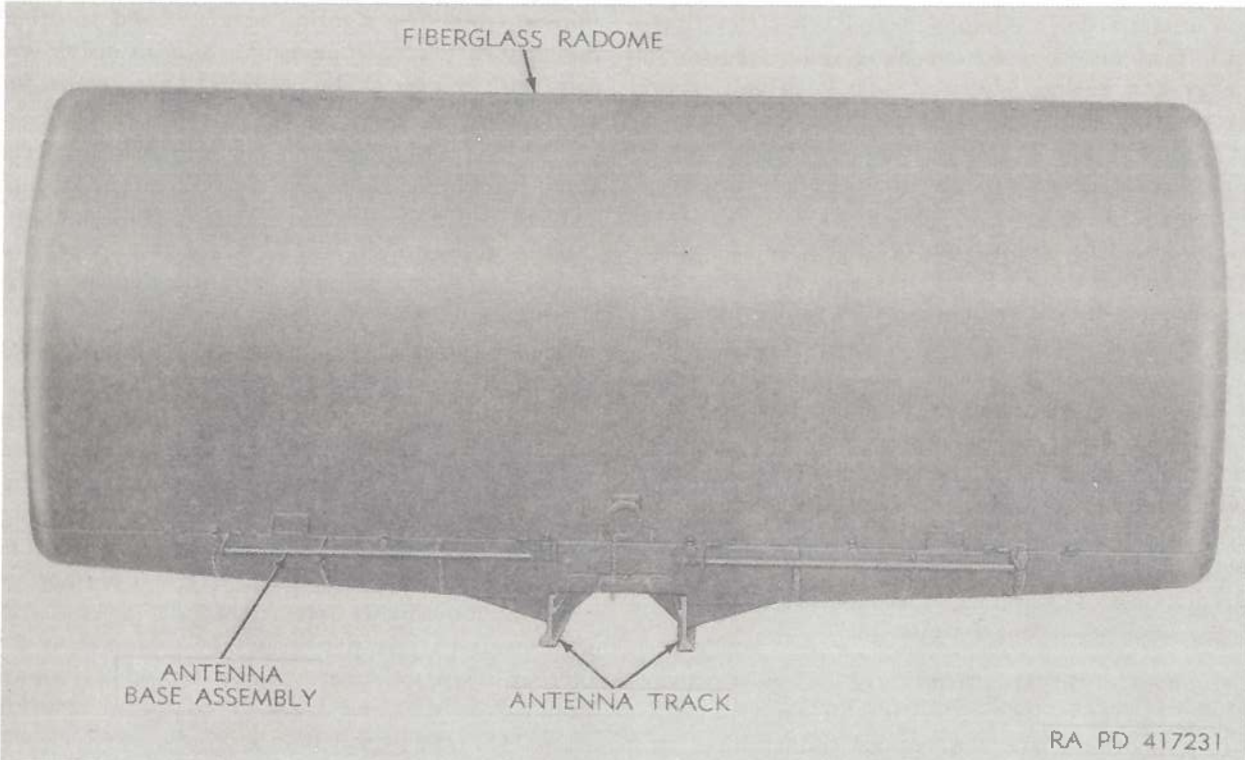


Figure 44 (U). Acquisition antenna-front view.

51 (U). Trailer Mounted Missile and Target Track Antenna-Receiver-Transmitter Groups

Note. The trailer mounted missile and target track antenna-receiver-transmitter groups are externally identical in their physical appearance; therefore, only the trailer mounted missile track antenna-receiver-transmitter group is described in this paragraph.

a. Trailer Mounted Missile Track Antenna-Receiver-Transmitter Group. The trailer mounted missile track antenna-receiver-transmitter group (fig. 47) consists of the missile track antenna-receiver-transmitter group and the antenna mount drop bed trailer. The antenna mount drop bed trailer and the missile track antenna-receiver-transmitter group are shown detached from each other on figures 48 and 49, respectively.

b. Missile or Target Track Antenna-Receiver-Transmitter Group. The missile or target track antenna-receiver-transmitter group (fig. 49) consists of the following major components: track antenna reflector assembly (fig. 50), track receiver-transmitter, track antenna pedestal, azimuth drive equipment enclosure, three leveling jack legs, and the track antenna radome (fig. 49). The entire missile or target track antenna-receiver-transmitter group is white in color to provide maximum reflection of heat rays from the sun. The track antenna pedestal, the track receiver-transmitter, and the track antenna reflector assembly can be rotated 360° in azimuth; the track receiver-transmitter and the track antenna reflector assembly can also be rotated in elevation to provide complete tracking radar coverage of the defended area.

(1) *Track antenna reflector assembly.* The track antenna reflector assembly (fig. 50) is a circular disk approximately 8 feet in diameter and 1⅔ feet deep. The reflector, constructed of fiber and aluminum, has fine wire imbedded in the fiber for reflection of signals and polarization. The track antenna reflector assembly is mounted on the track receiver-transmitter, and is used to transmit and receive radio frequency energy.

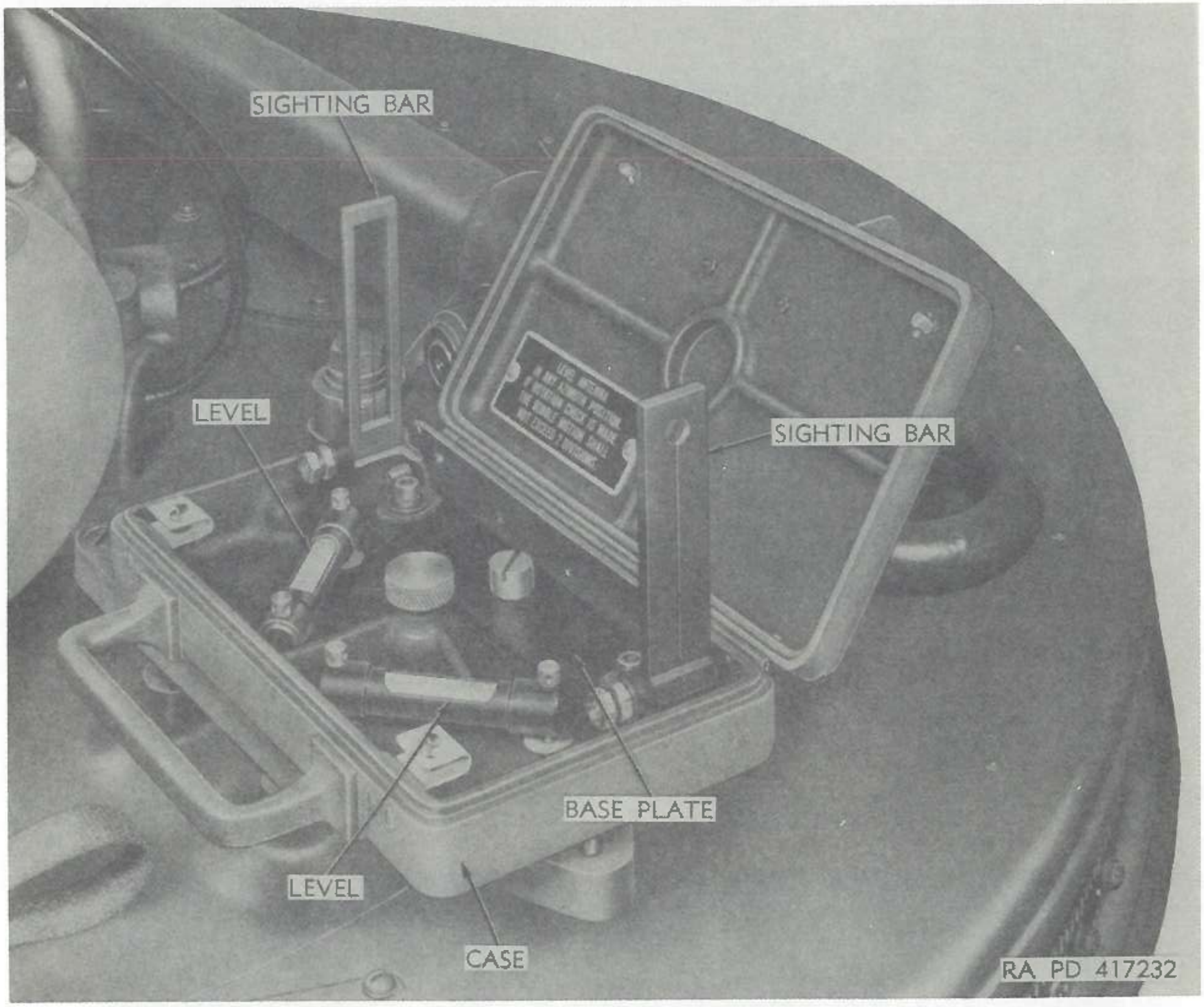
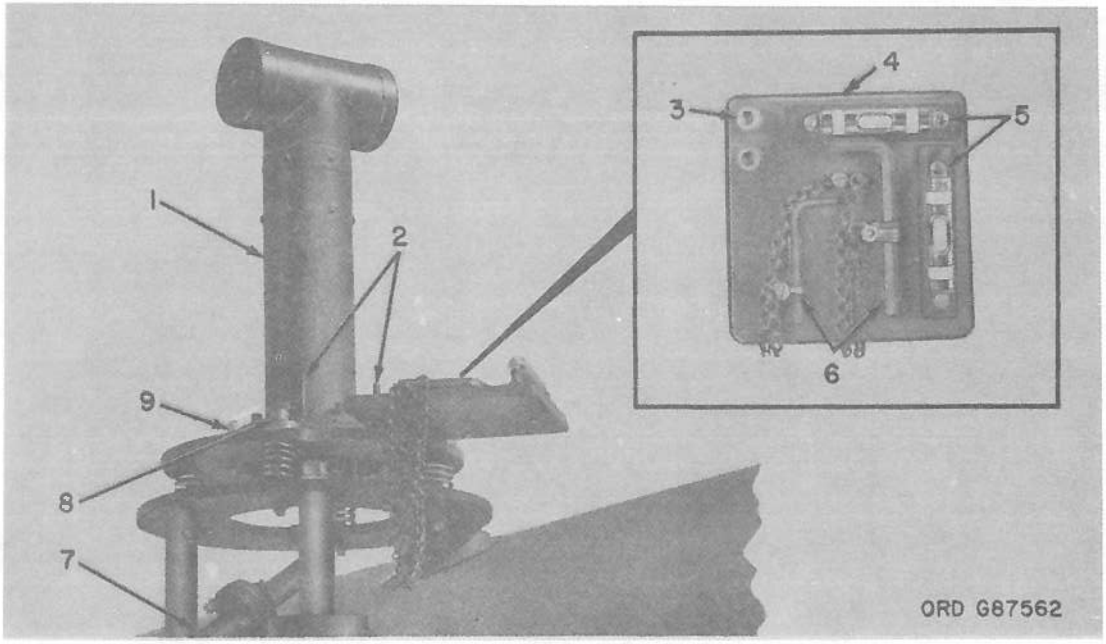


Figure 45 (U). Acquisition orientation level.

(2) *Track receiver-transmitter.* The track receiver-transmitter is a dome-shaped enclosure mounted between the two uprights of the track antenna pedestal. The track receiver-transmitter is approximately 4 feet in length and 3⅓ feet in diameter. The track receiver-transmitter contains transmitting and receiving equipment for the missile tracking radar system. A cover on the rear of the track receiver-transmitter permits access to this internal equipment.

(3) *Track antenna pedestal.* The track antenna pedestal, which supports the track receiver-transmitter, the track antenna reflector assembly, and the track antenna radome, is a U-shaped magnesium casting mounted on the azimuth drive equipment



1—Auxiliary antenna subassembly
2—Azimuth orientation sight (2)
3—Level mounting screws (2)
4—Level assembly
5—Level (2)
6—Socket head screw wrench (2)
7—RF transmission line
8—Leveling screws (4)
9—Azimuth orientation locking screws (4)

Figure 45.1 (U). Auxiliary antenna subassembly and level mounted on acquisition antenna—systems with AJD capabilities.

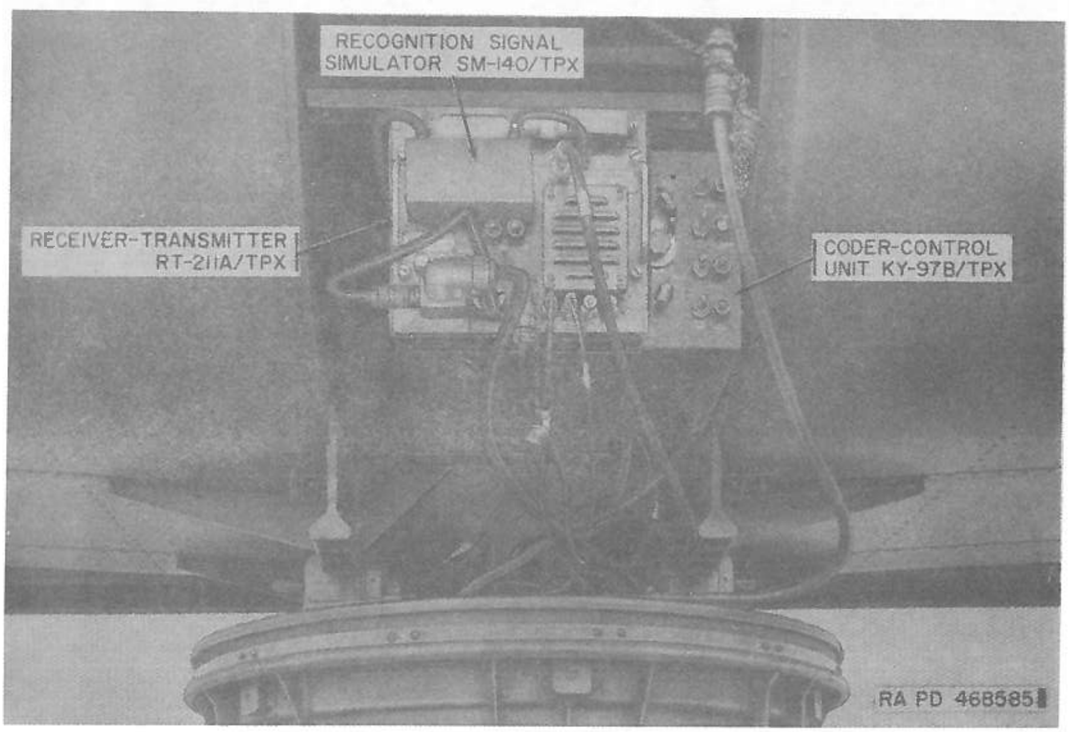


Figure 46 (U). Part of interrogator set AN/TPX-27 and Mark X SIF/IFF equipment installed.

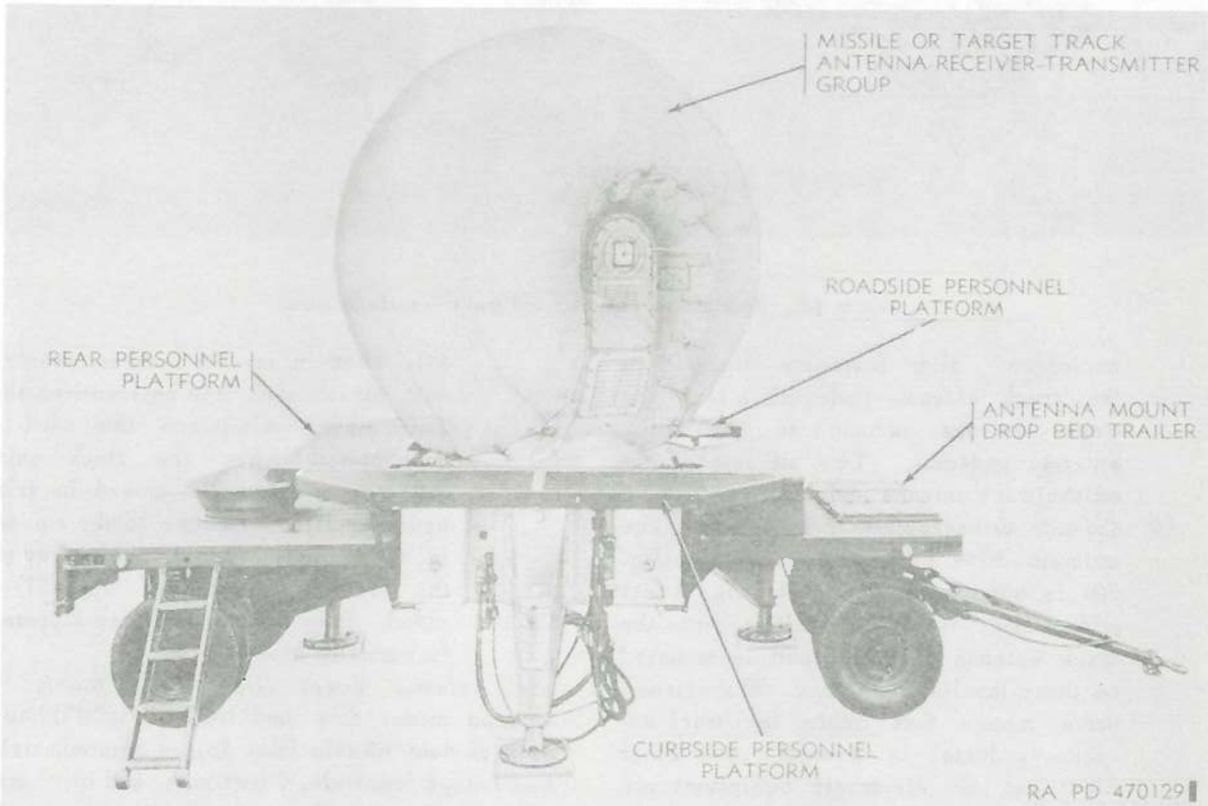


Figure 47. Trailer-mounted missile or target track antenna-receiver-transmitter group - overall view.

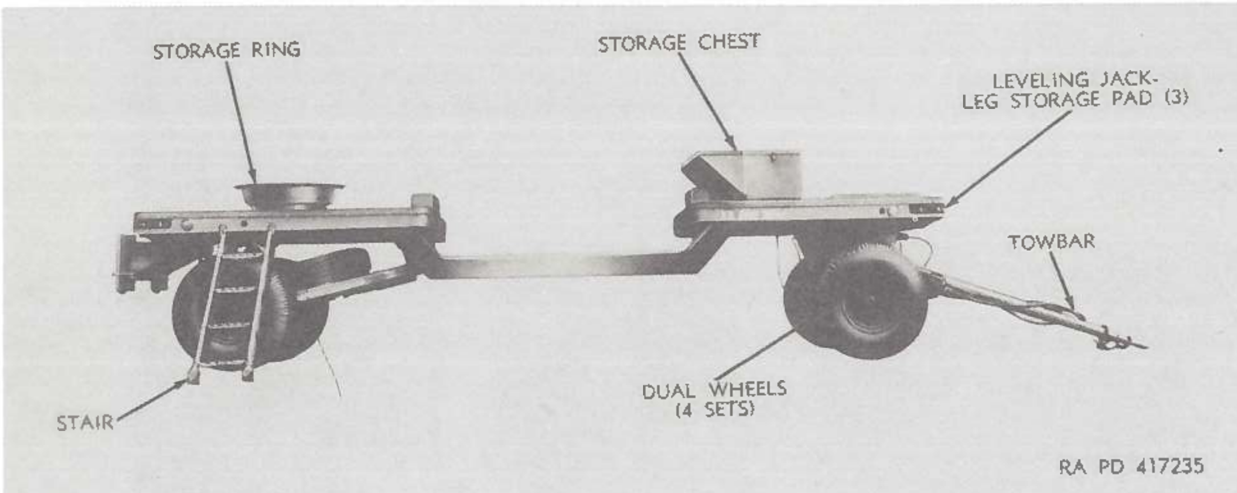


Figure 48. Antenna mount drop bed trailer—curbside view.

enclosure. Slide fasteners (fig. 49) on the track antenna pedestal attach the track antenna radome to the track antenna pedestal. Two air intakes are on the track antenna pedestal.

(4) *Azimuth drive equipment enclosure.* The azimuth drive equipment enclosure (fig. 50) is approximately 8 feet long, 6 feet wide, and 5 feet high. It supports the track antenna pedestal, and is mounted on three leveling jack legs. The azimuth drive motors that rotate the track antenna pedestal in azimuth, and other electrical and electronic equipment are housed in the azimuth drive equipment enclosure. An access door (fig. 49) permits access to the equipment.

(5) *Track antenna radome.* The track antenna radome (fig. 49), a waterproof hood constructed of Plexiglas, covers the track antenna reflector assembly, the track receiver-transmitter, and the track antenna pedestal. The hood is securely attached to the track antenna pedestal (fig. 50) by means of slide fasteners (fig. 49). When in use the hood is pressurized with air to give it a balloon-like shape. This shape minimizes the wind drag encountered when the track antenna reflector assembly is moved in azimuth and elevation. Access to the equipment in the radome may be gained by using the rectangular opening (fig. 51) provided. It is secured by three zippers and is normally closed.

c. Antenna Mount Drop Bed Trailer. The antenna mount drop bed trailer (fig. 47) has four sets of dual wheels (fig. 48), is approximately 21 feet long, 8 feet wide, 4 feet high, and olive drab in color. A tow bar permits attachment of the trailer to a prime mover. On the forward bed of the trailer are three leveling jack-leg storage pads (fig. 48) approximately 30 inches long and 20 inches wide. Leveling jack legs (fig. 50) are secured to these pads when the trailer is in transit. A storage chest (fig. 48) for storage of the track antenna radome and antenna hoist assembly is behind the three jack-leg storage pads. This chest is approximately 8 feet long, 1-2/3 feet wide,

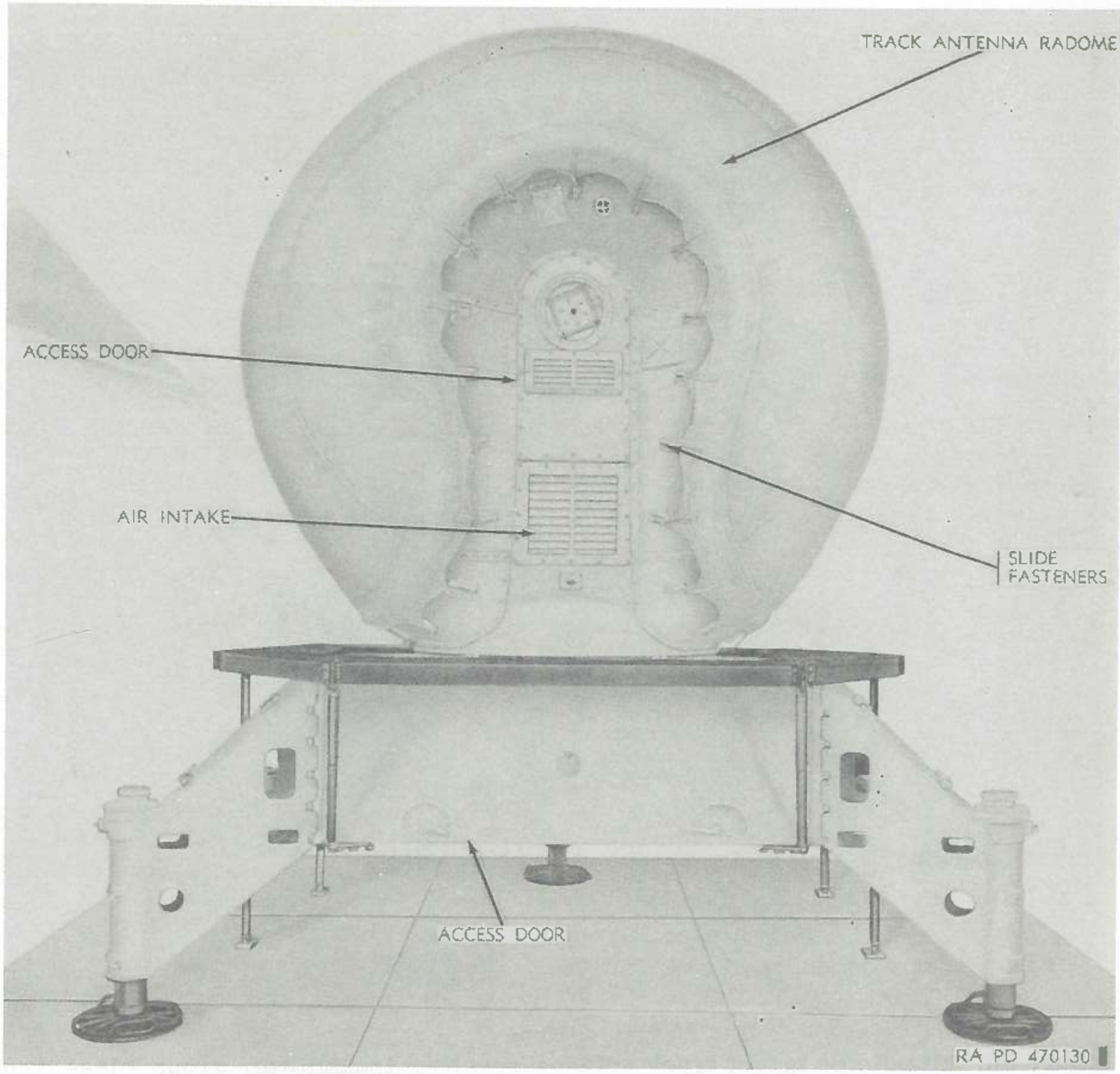


Figure 49. Missile or target track antenna-receiver-transmitter group - overall view.

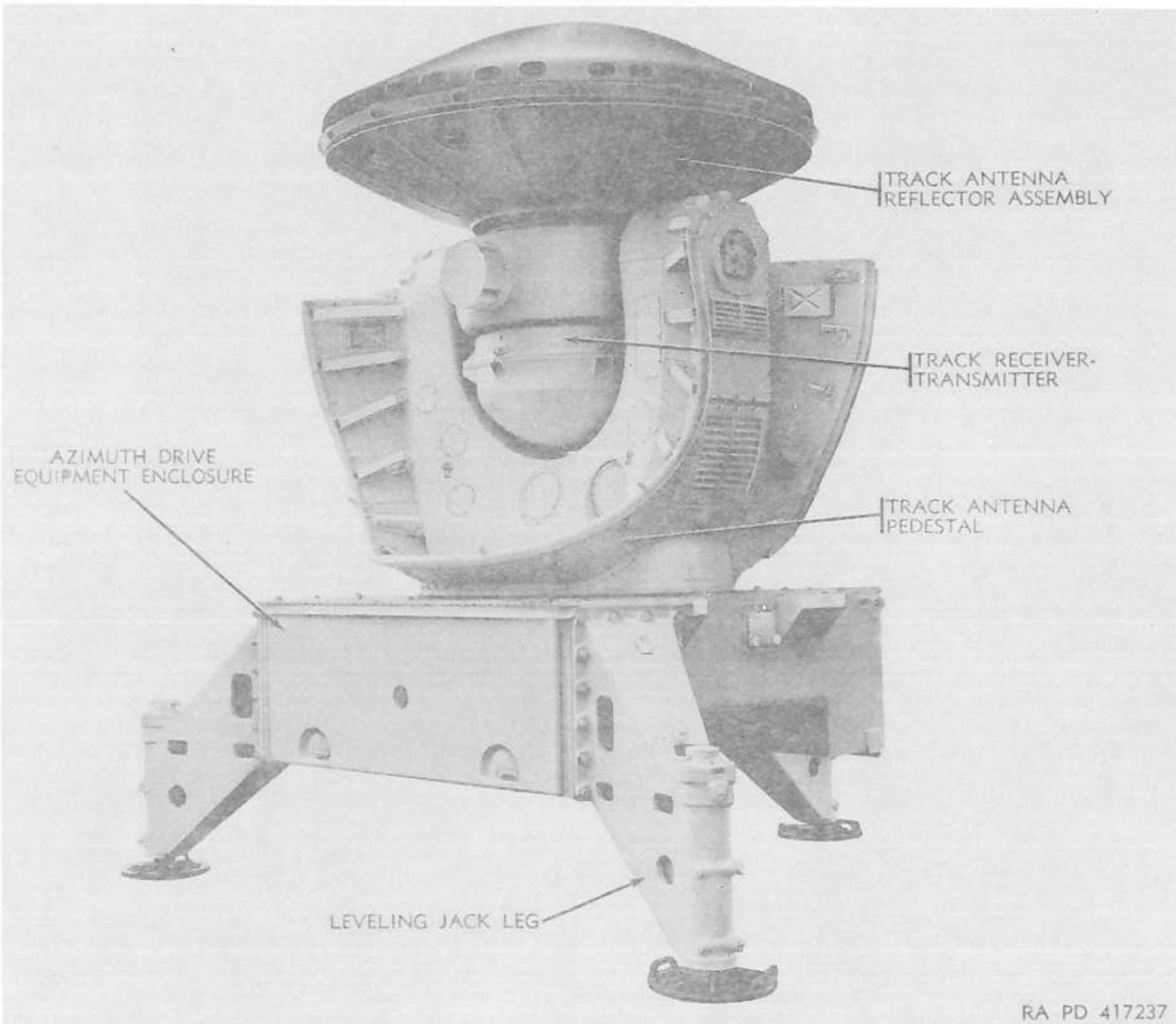


Figure 50. Missile or target track antenna-receiver-transmitter group - less track antenna radome - overall view.

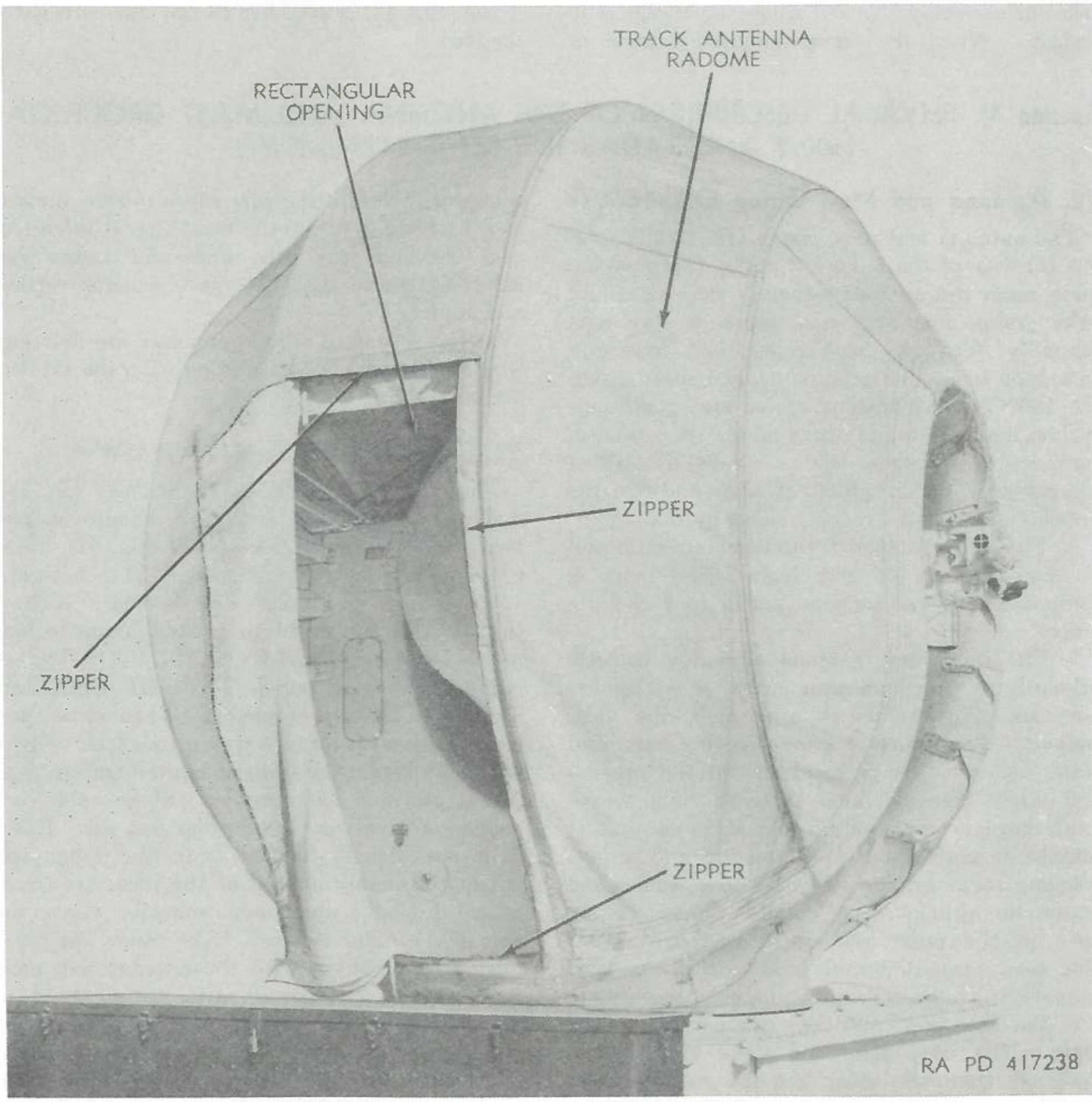


Figure 51. Missile or target track antenna-receiver-transmitter group—partial view.

and 1⅝ feet deep. On the rear of the trailer is a storage ring (fig. 48) approximately 28 inches in diameter, on which is stored the track antenna reflector assembly (fig. 50) when the trailer is in transit. When the trailer-mounted missile or target track antenna-receiver-transmitter group is emplaced, the storage ring provides storage space for the receiver-transmitter protective cover. A stair (fig. 48) is attached to the rear curbside of the trailer.

Section V. PHYSICAL DESCRIPTION OF THE ANTENNA AND MAST GROUP OA-1600/T AND RADAR TEST SET TS-847A/MSW-1

52. Antenna and Mast Group OA-1600/T

The antenna and mast group OA-1600/T (fig. 52) consists of the following major components: mast, radar test antenna assembly, base plate and yoke group, four stay wire ropes, a stay wire assembly, four guy wire ropes, and four guy wire rope hoists. The antenna and mast group OA-1600/T will withstand varied load conditions such as high winds and heavy icing. It is used in conjunction with radar test set TS-847A/MSW-1 (described in paragraph 53) to aline and test the missile- and target- tracking radar systems.

a. The mast is tapered, tubular aluminum and is approximately 60 feet high. The mast is composed of seven sections joined in a definite order.

b. The radar test antenna assembly consists primarily of four indicator arms, a waveguide horn, six sighting bars, six scale dials, and mast support. The indicator arms, sighting bars, and scale dials are used in alinement of the missile- and target tracking radar systems. The waveguide horn is adjustable in elevation so that it may be properly alined to the missile- and target-tracking radar groups. A waveguide, suspended within the tubular mast, couples the waveguide horn to the radar test set TS-847A/MSW-1. The mast support is connected to the mast and supports the indicator arms and a waveguide horn.

c. The base plate and yoke group supports the mast. The base plate and yoke group is so designed that the mast can be rotated 360° in azimuth and locked in any desired position. A boom attached to the base plate and yoke group is used with two lifting wire ropes to erect a mast, and as a lever to rotate the mast after it is erected.

d. The four stay wire ropes and a stay wire assembly assure that the mast remains vertical and in place.

e. The four guy wire ropes and the four guy wire rope hoists support and position the antenna and mast group OA-1600/T.

53. Radar Test Set TS-847A/MSW-1

The radar test set TS-847A/MSW-1 (fig. 53), mounted on the lower section of the antenna and mast group assembly OA-1600/T (fig. 52), measures approximately 20 inches high, 24 inches wide, 16 inches high, and is olive drab in color. A cover (fig. 53) opens upward to permit access to four panels behind: MISSILE OSCILLATOR, test set monitor indicator panel, TARGET OSCILLATOR, and RF power meter. When closed and locked, the cover forms a waterproof seal. Power and control from the trailer mounted tracking station is provided by means of a single cable connection on the rear of the radar test set. Radio frequency signals to and from the radar test antenna assembly on top of the mast are transmitted through a waveguide connector, also on the rear of the radar test set. The radar test set is used in conjunction with the antenna and mast group OA-1600/T, described in paragraph 52, to properly aline the missile and target-tracking radar systems. For test purposes the radar test set is substituted for a target so that checks and adjustments can be made on the missile and target-tracking radar system.

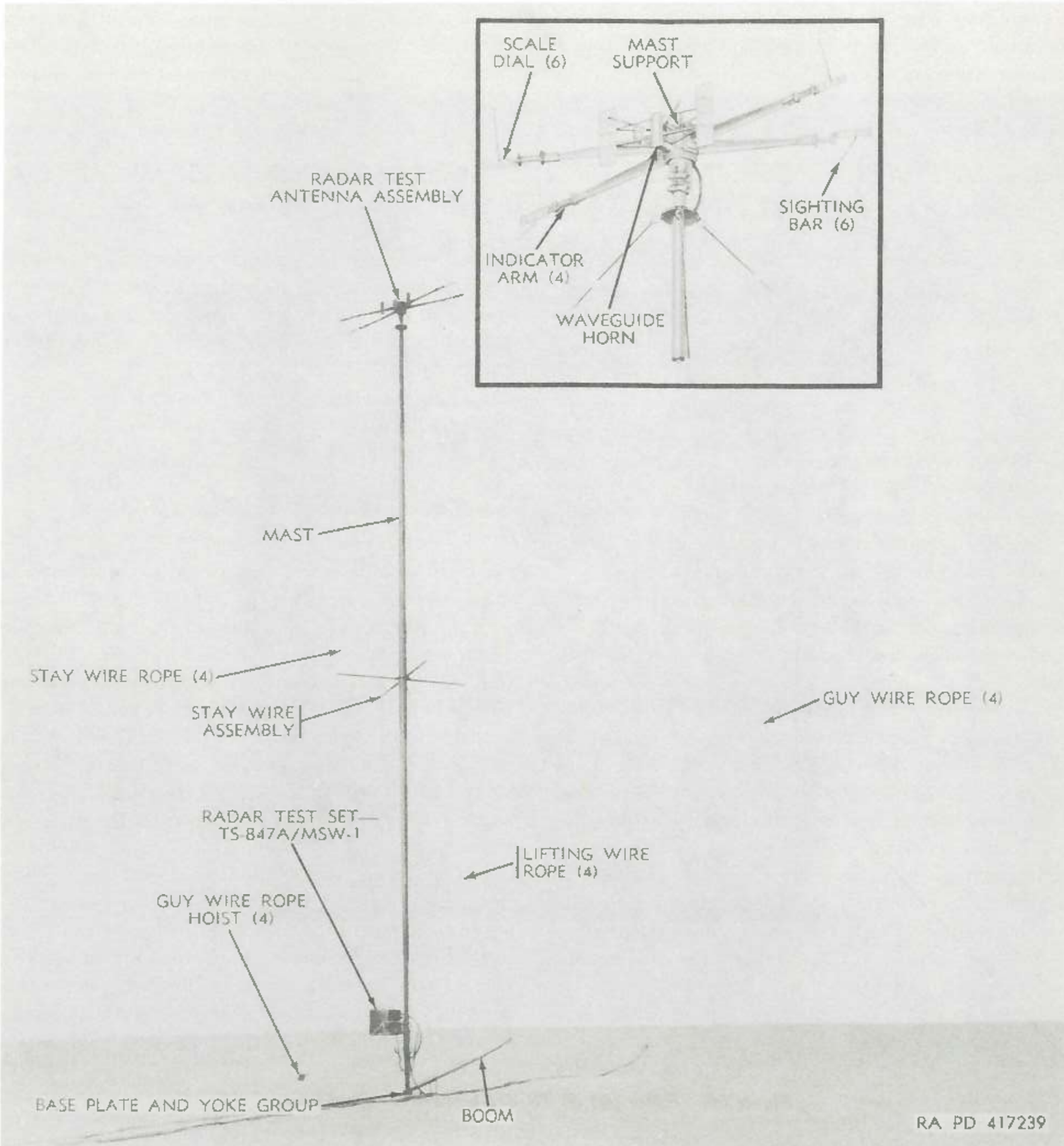


Figure 52. Antenna and mast group OA–1600/T—overall view.

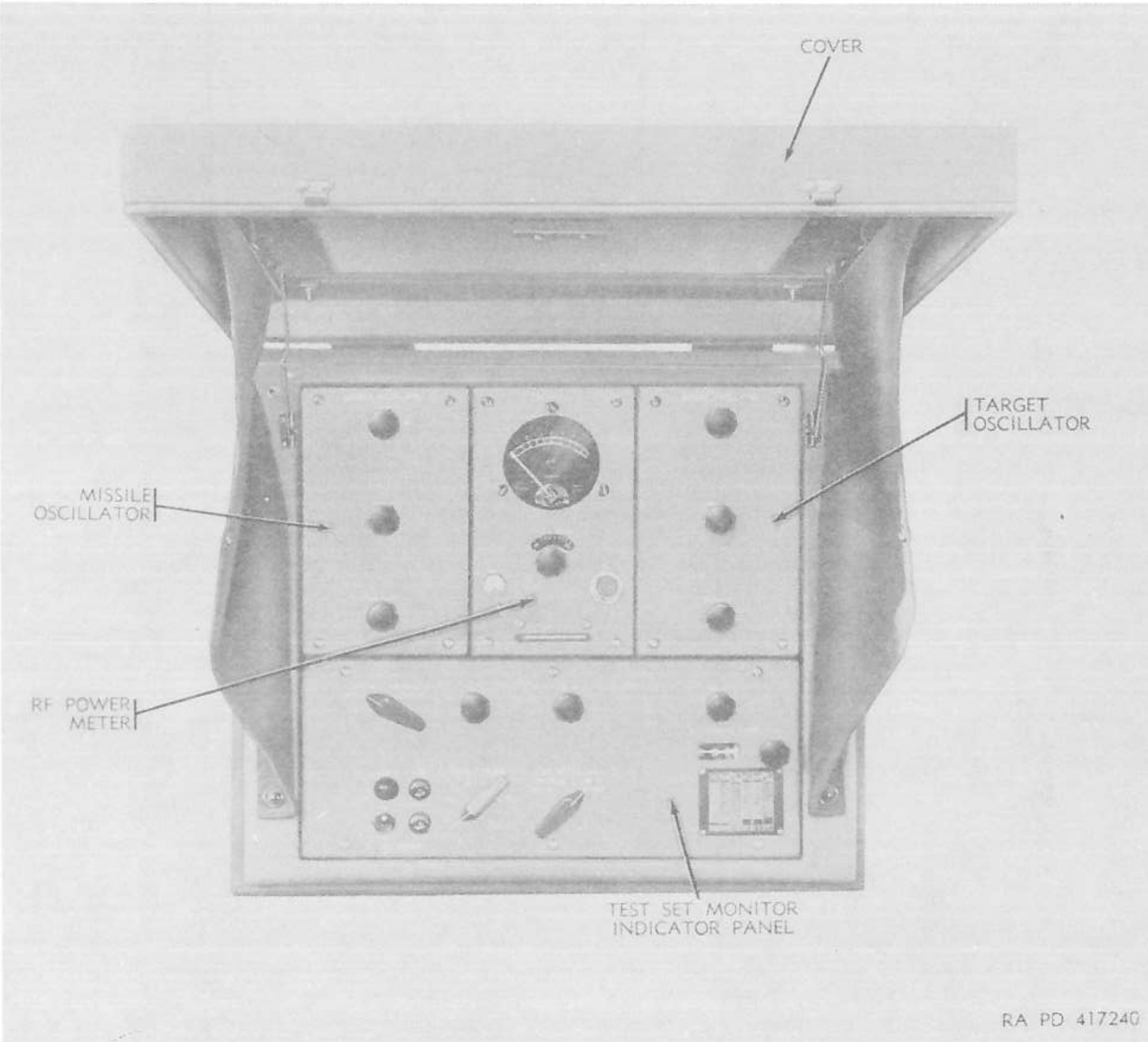


Figure 53. Radar test set TS-847A/MSW-1—front view.

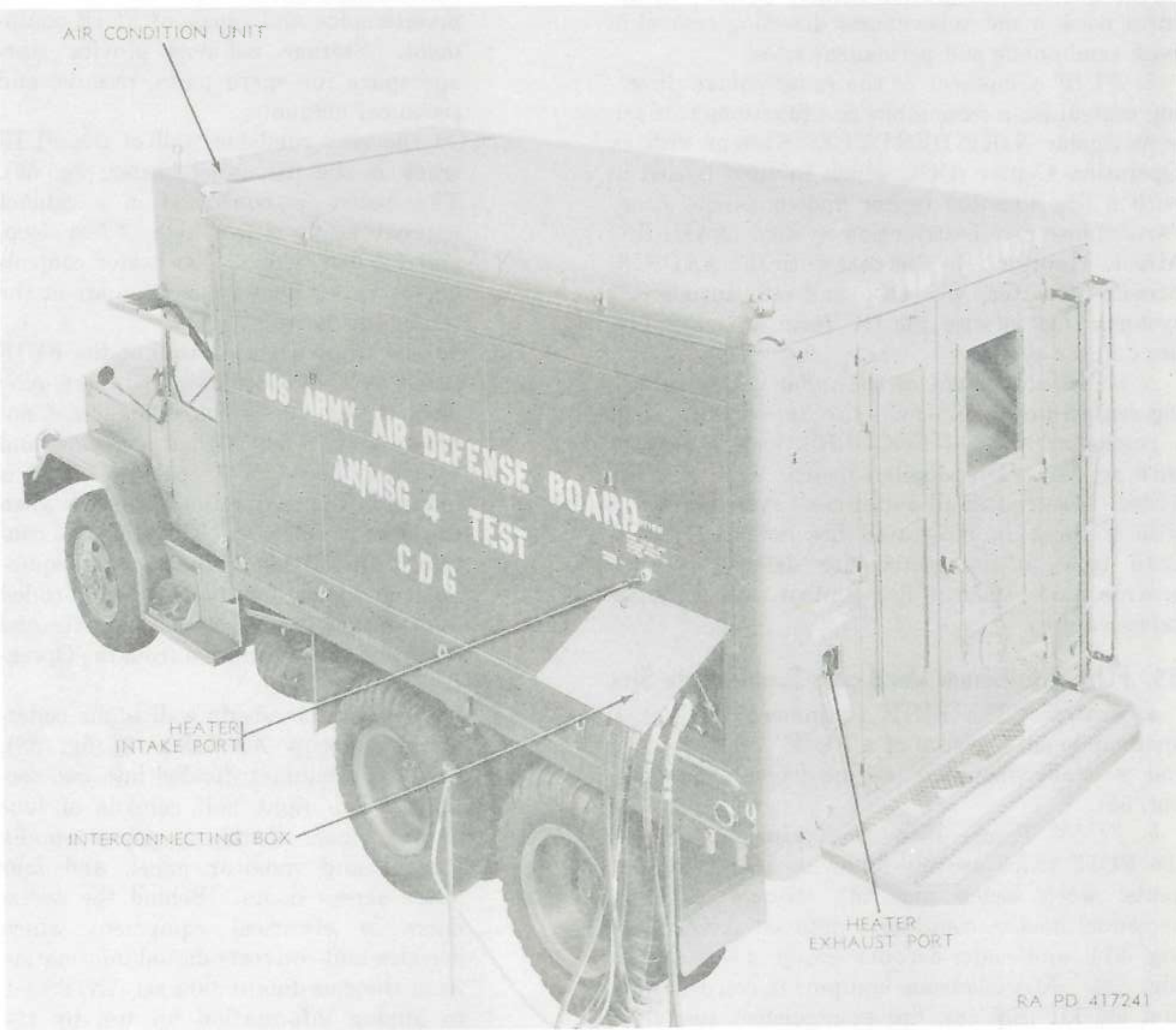


Figure 54. FUIF truck—outside left oblique view.

Section VI. PHYSICAL DESCRIPTION OF THE FIRE UNIT INTEGRATION FACILITY (FUIF)

54. General

a. This section contains a physical description of the fire unit integration facility (FUIF) equipment used in the radar course directing central in both semimobile and permanent sites.

b. FUIF equipment of the radar course directing central for a semimobile site functions to tie in a particular NIKE-HERCULES System with an Operation Center (OC), which in turn is tied in with a fire direction center known as the Army Air Defense Fire Distribution System (AADFDS) Missile Monitor. In this case both the AADFDS Missile Monitor, the OC, and all antiaircraft systems tied in with the OC form an integrated fire defense system.

c. FUIF equipment of the radar course directing central for a permanent site functions to tie in a particular NIKE-HERCULES System directly with an AADFDS Missile Master. The AAFDS Missile Master and all antiaircraft systems tied in with it form an integrated fire defense system. Both types of integrated fire defense systems provide more efficient fire control over a larger defended area.

55. FUIF Equipment Used at a Semimobile Site

a. *General*. The FUIF equipment used at a semimobile site consists of a FUIF truck (fig. 54) and a trailer-mounted engine-driven generator (fig. 55).

b. *FUIF Truck—Internal Equipment*. Inside the FUIF truck are the following major components: work bench (fig. 56), storage cabinets, personnel heater, coordinate data set AN/TSQ-8 (fig. 57), and coder-decoder group AN/MSQ-18 (fig. 58). Miscellaneous equipment consists of a first aid kit (fig. 56), fire extinguisher, two telephones (fig. 57), tool rack and tools (fig. 58), state of alert (equipment status) panel, thermostat, and air condition switch panel. The major components are discussed in (1) through (4) below; miscellaneous equipment is discussed in (5) below.

(1) On the rear curbside wall of the FUIF truck is the work bench (fig. 56). Above the work bench are storage cabinets. The work bench provides space for maintenance and repair of FUIF equipment. Storage cabinets provide storage space for spare parts, records, and technical manuals.

(2) On the rear roadside wall of the FUIF truck is the personnel heater (fig. 56). The heater is contained in a cabinet approximately 4 feet high, 2 feet deep, and 1½ feet wide. The heater controls necessary for heater operation are at the top of this cabinet.

(3) On the front curbside wall of the FUIF truck is the coordinate data set AN/TSQ-8 (fig. 57) which is a cabinet approximately 6 feet high, 2 feet wide, and 1½ feet deep. The cabinet door is hinged in the center and folds back when the door is opened. These chassis contain transmitting and receiving equipment necessary for transmission of coded information from the coder-decoder and reception of information from the Operation Center (OC).

(4) On the front roadside wall is the coder-decoder group AN/MSQ-18 (fig. 58), which is a cabinet divided into two sections. The right half consists of four upper access doors, a power supply control and monitor panel, and four lower access doors. Behind the access doors is electrical equipment which decodes and converts digital information from the coordinate data set AN/TSQ-8 to analog information for use by the computer system. This electrical equipment also codes and converts analog information from the computer system to digital information which is applied to the coordinate data set AN/TSQ-8 for transmission. The left half of the cabi-

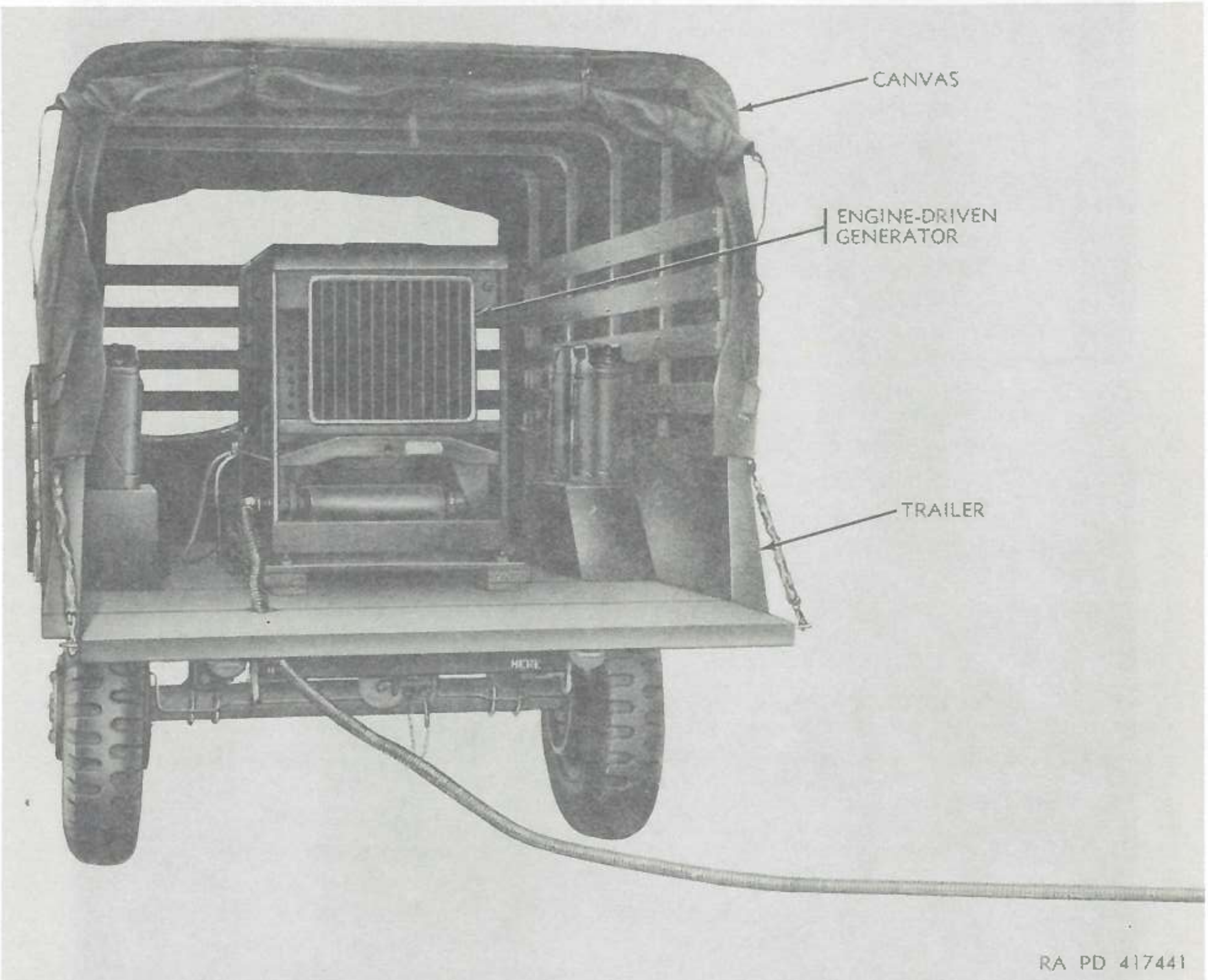


Figure 55. Trailer-mounted engine-driven generator—overall view.

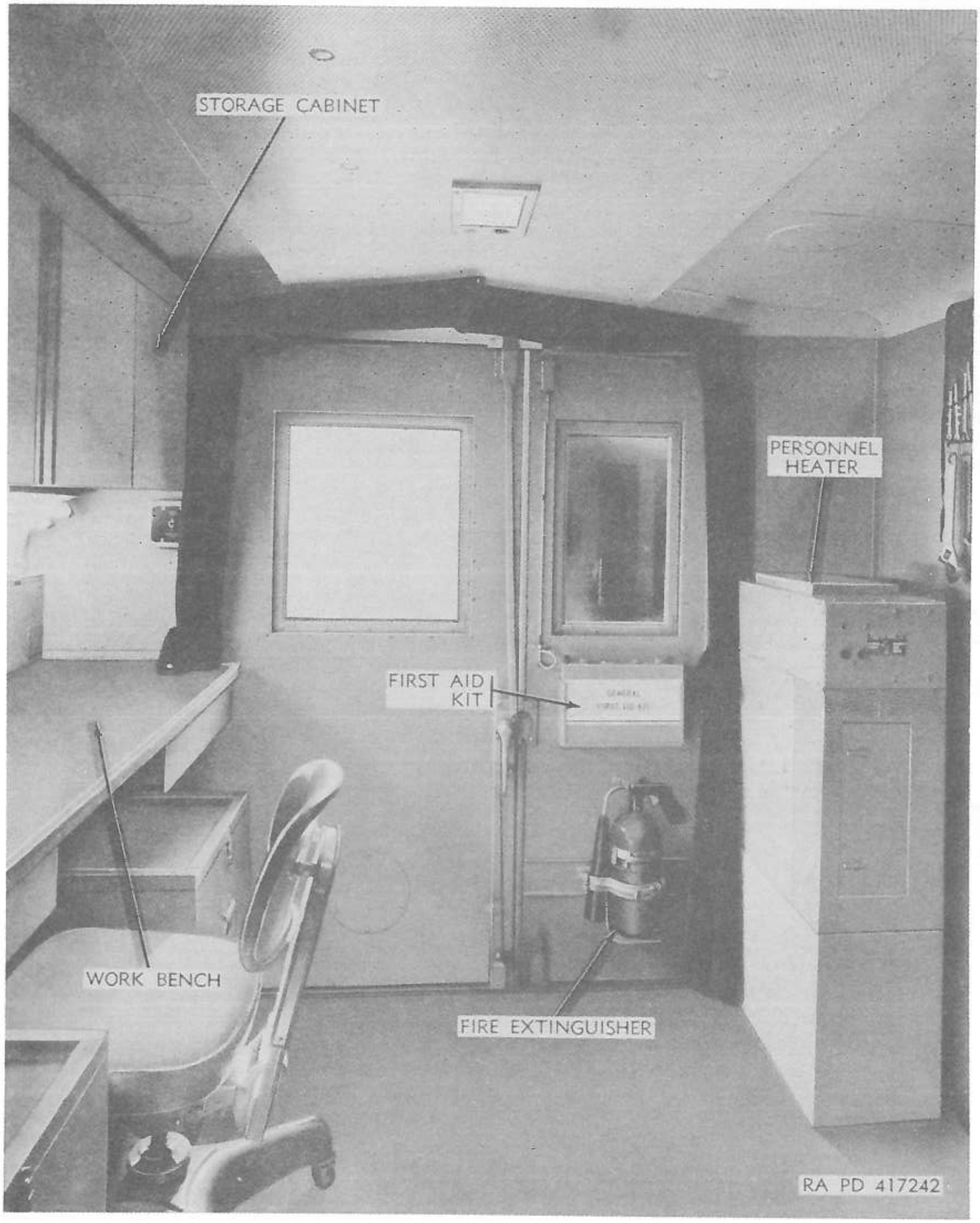


Figure 56. FUIF truck—inside rear view.

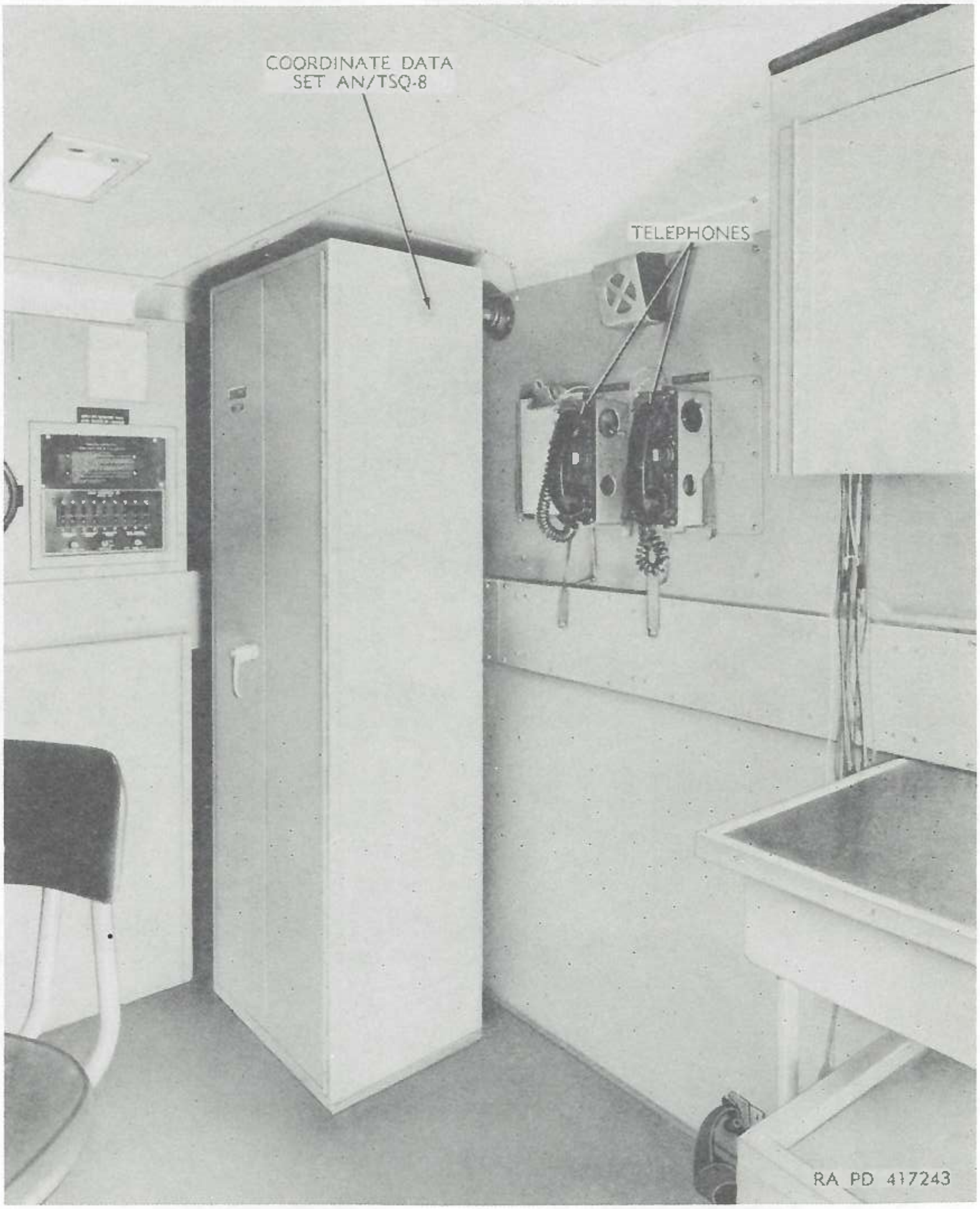


Figure 57. FUIF truck—inside front right view.

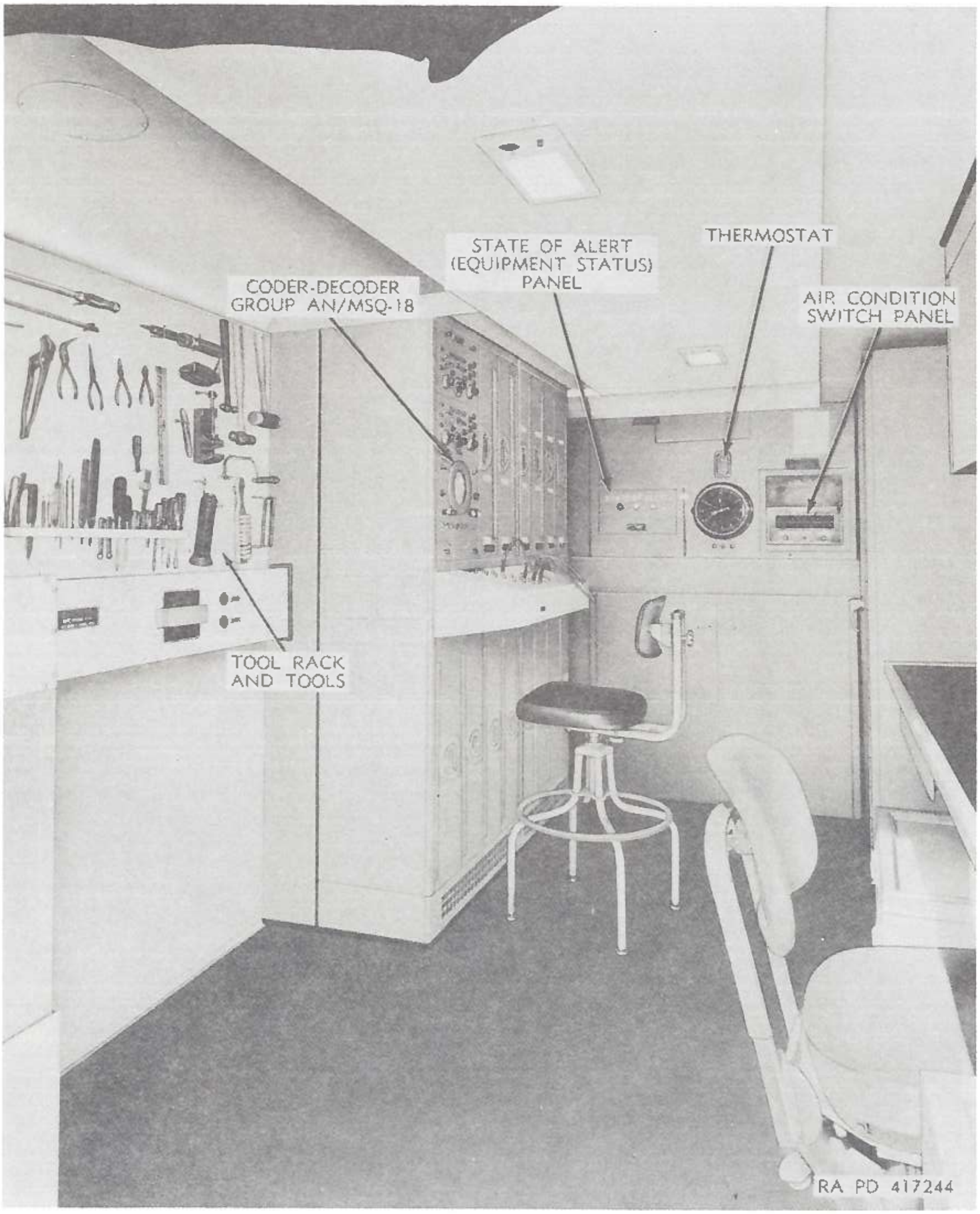


Figure 58. FUIF truck—inside front left view.

net has three monitor panels, one above the other, used in the operation of the coder-decoder group AN/MSQ-18. To the right of the monitor panels are two more access doors. Four access doors are beneath a desk panel. These access doors permit access to the coder-decoder electrical equipment behind. The desk panel contains a patch board used in the operation of the coder-decoder group AN/MSQ-18.

(5) On the rear inside door of the FUIF truck is a fire extinguisher (fig. 56) and a first aid kit. Mounted on the curbside wall between the work bench and the coordinate data set AN/TSQ-8 (fig. 57) are two telephones for voice communication. A tool rack with tools (fig. 58) is on the roadside wall between the coder-decoder group AN/MSQ-18 and the personnel heater (fig. 56). These tools are provided for maintenance of the FUIF equipment. Against the front wall of the FUIF truck is the air condition switch panel (fig. 58) associated with the operation of the air condition unit (fig. 54). A thermostat (fig. 58) controls the temperature inside the FUIF truck. To the left of the thermostat is the state of alert (equipment status) panel on which are four equipment stayus indicator lights.

c. FUIF Truck—External Equipment. The FUIF truck is a conventional, six-wheel truck with a covered van, and is olive drab in color. A door at the rear permits entrance to the van. External equipment other than that normally found on similar trucks consists of the following: air condition unit (fig. 54), HEATER INTAKE port, heater exhaust port, and an interconnecting box.

d. Trailer-mounted Engine-driven Generator. The trailer-mounted engine-driven generator (fig. 55) is approximately 7 feet wide, 13 feet long, and 8 feet high. The engine-driven generator is mounted inside the trailer. The engine-driven generator weighs 1,250 pounds, and the trailer weighs 1,400 pounds, for a total combined weight of 2,650 pounds.

(1) The trailer is two-wheeled and has a minimum load limit of 1½ tons. The top of the trailer is covered with a canvas. A towbar on the front of the trailer permits attachment to a prime mover.

(2) The engine-driven generator provides a three-phase 60-cps output with a maximum power output of 12.5 kv. The generator normally operates at 1,800 rpm.

56. FUIF Equipment Used at Permanent Site

a. General. The FUIF equipment used at a permanent site is in the FUIF portion of the electronic shop building (fig. 59). The 400-cycle power for the FUIF equipment is obtained from one of the engine-driven generators in the engine generator building (fig. 14).

b. FUIF Housing and Equipment Cables. The FUIF portion of the electronic shop building consists of two separate rooms which are accessible only through the outside doors (fig. 59). The room on the left houses the FUIF terminal equipment. The room on the right houses an air-conditioning unit and a heating unit for the FUIF equipment. The FUIF equipment cables terminate in the left room (fig. 60). The FUIF data is connected into the director station trailer by the use of four cables (fig. 61).

c. FUIF Terminal Equipment. The terminal equipment in the FUIF portion of the electronic shop building is the coordinate data pallet (fig. 62). This pallet contains four racks designated A through D from left to right. Miscellaneous equipment also in the room is as follows: two telephone lines (fig. 60), FUIF cables, test scope and test scope cart, tool set, workbench, fire extinguisher, storage cabinet, and two thermostats. The components of the coordinate data pallet are discussed in (1) through (4) below; miscellaneous equipment is discussed in (5) below.

Figure 59. Electronic shop building and associated equipment—overall view.

(1) The A rack contains the distribution panel (fig. 60) and coordinate data set AN/TSQ-8 (fig. 63).

(*a*) The distribution panel routes the cables between the FUIF equipment and the battery.

(*b*) The coordinate data set is mounted on a swinging frame approximately 6 feet high (fig. 63). Nine electrical chassis are mounted on the swinging frame. These chassis contain transmitting and receiving equipment used for transmission and reception of coded information between the battery and the missile master.

(2) The B rack regulator panel is mounted on a hinged frame which is approximately 6 feet high (fig. 64). This panel contains the data converter and test panel and three ac regulators. The data converter converts target data into appropriate coordinates and provides computation test functions. The three ac regulators regulate the line voltages used in the FUIF equipment.

(3) The C rack ground slant range computer panel is mounted on a hinged frame which is approximately 6 feet high (fig. 65). This panel contains a summing amplifier, problem unit, range computer, and dc regulator. The summing amplifier sums the components of target range coordinates into battery coordinates. The problem unit provides simulated data checks on the computer panel. The range computer solves the ground range coordinates of the target. A dc regulator mounted on

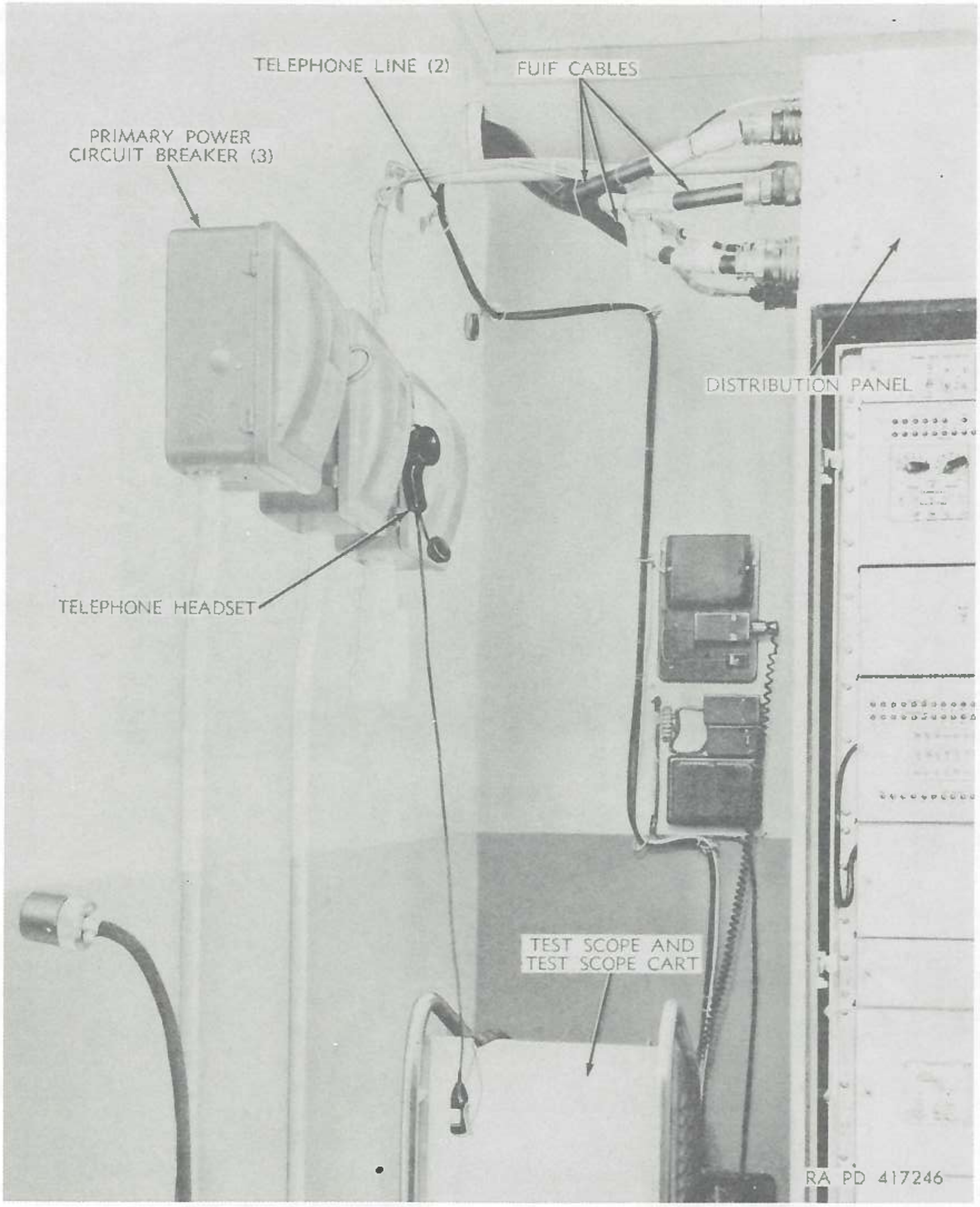


Figure 60. FUIF equipment cables—inside left view.

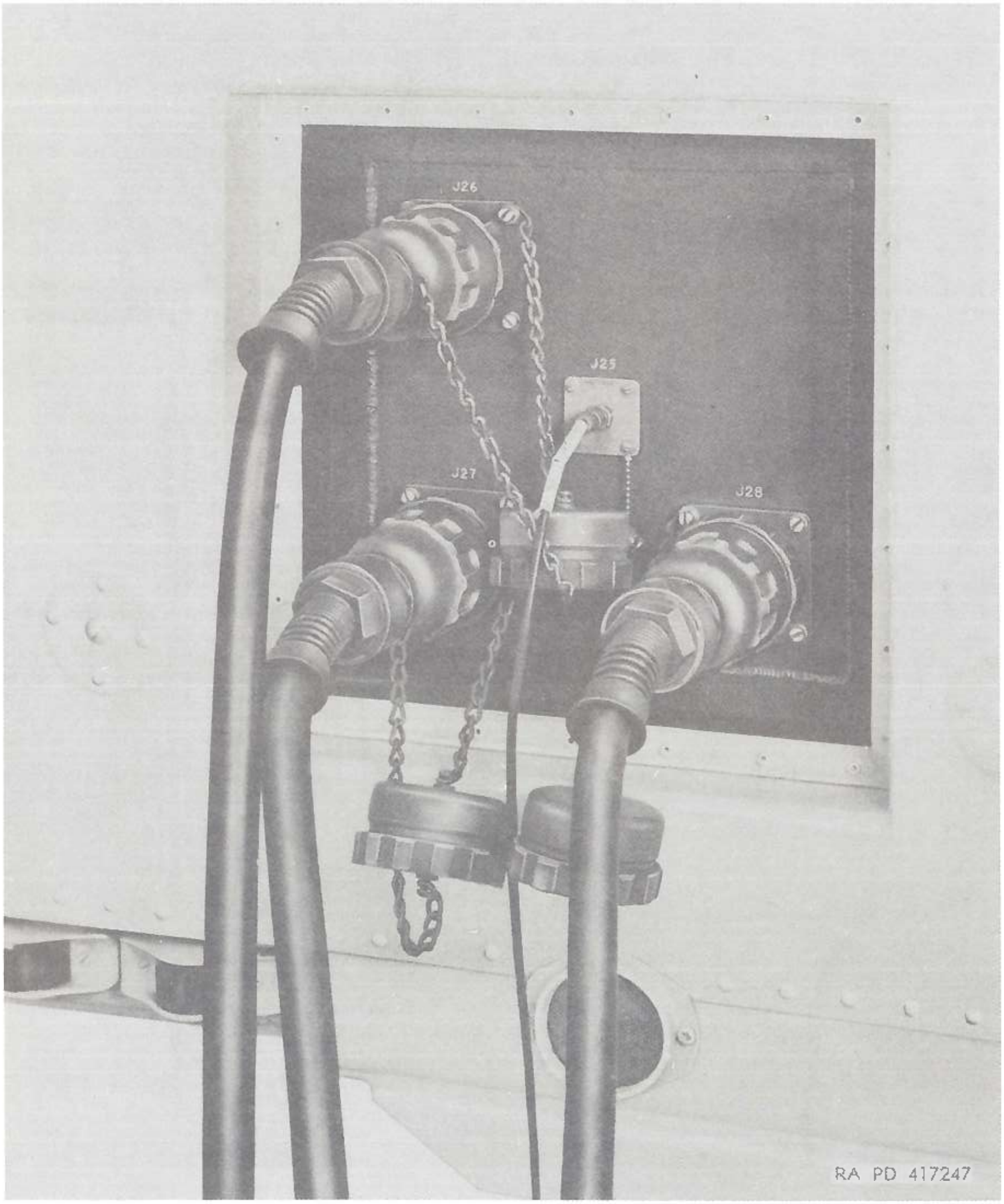


Figure 61. FUIF director station trailer cables—outside view.

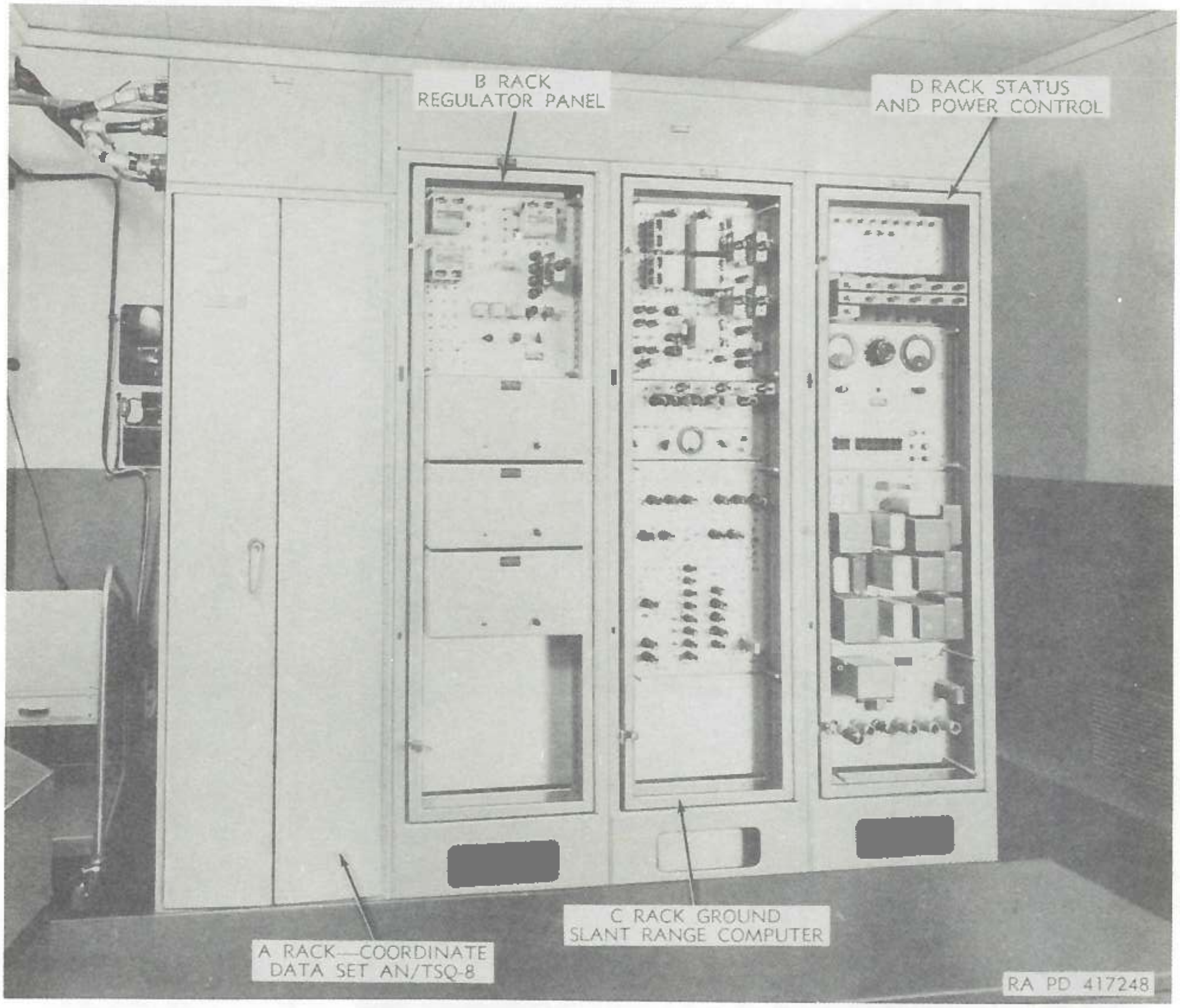


Figure 62. FUIF terminal equipment (coordinate data pallet)—overall view.

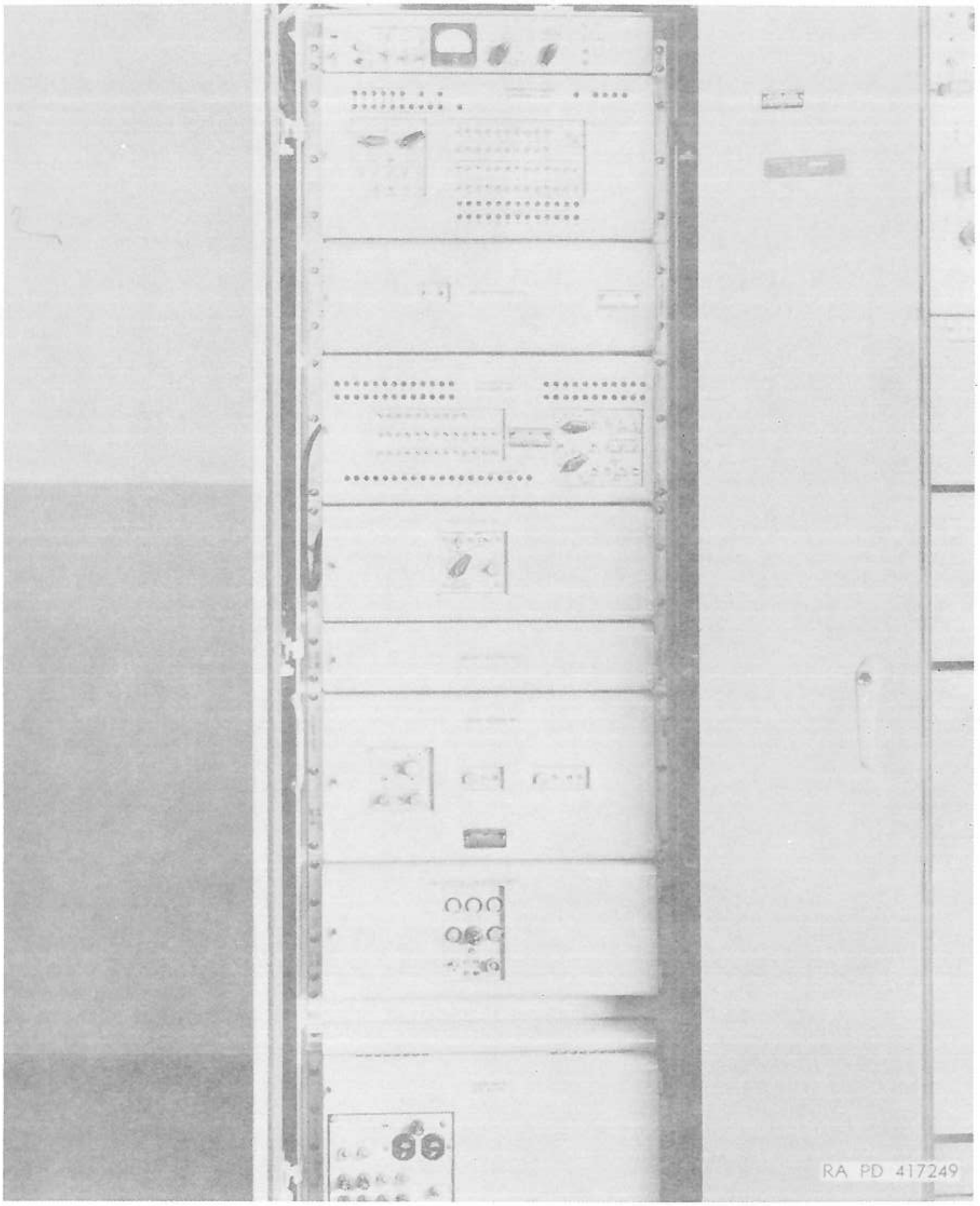


Figure 63. A rack-coordinate data set AN/TSQ–8—front view.

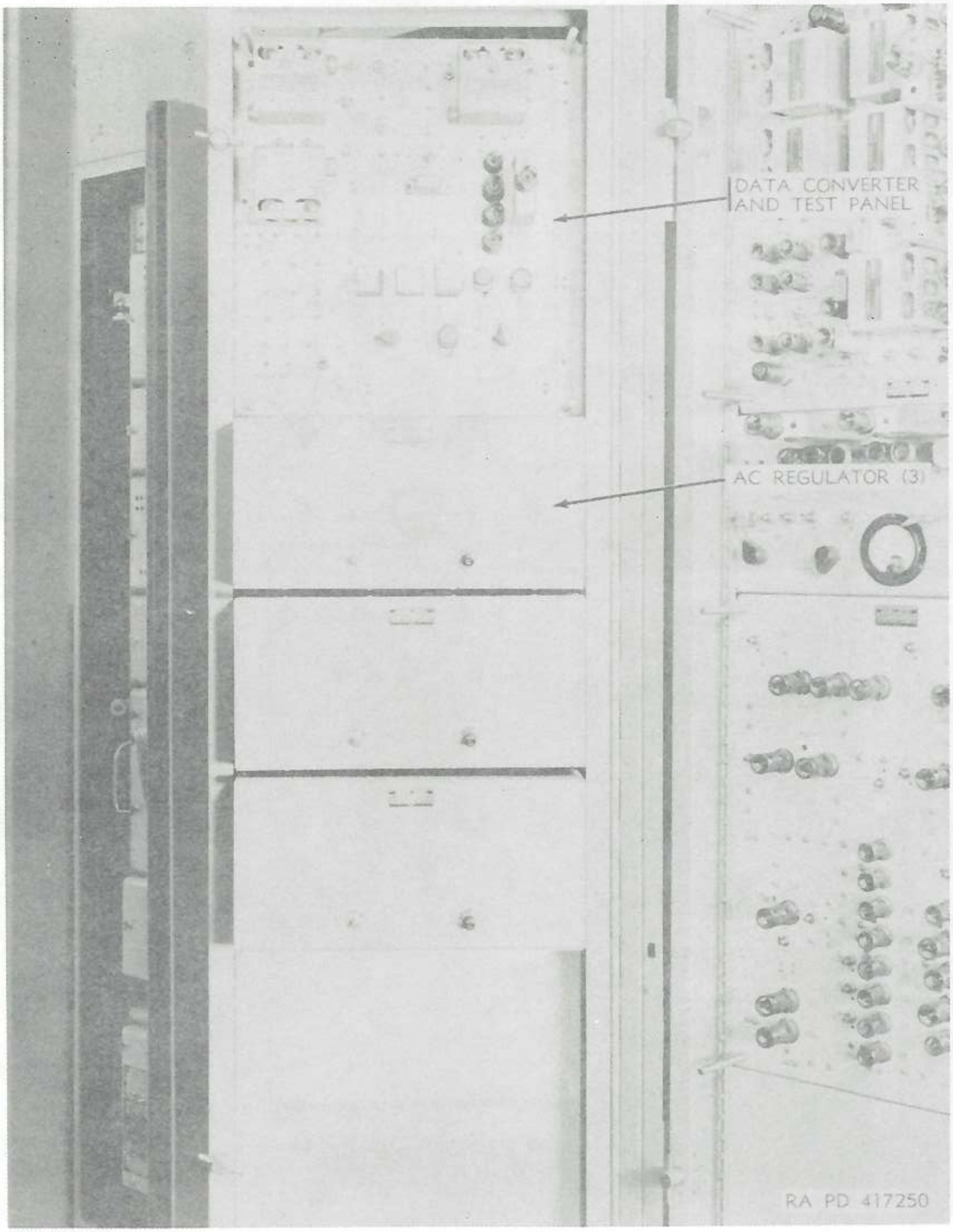


Figure 64. B rack regulator panel—front view.

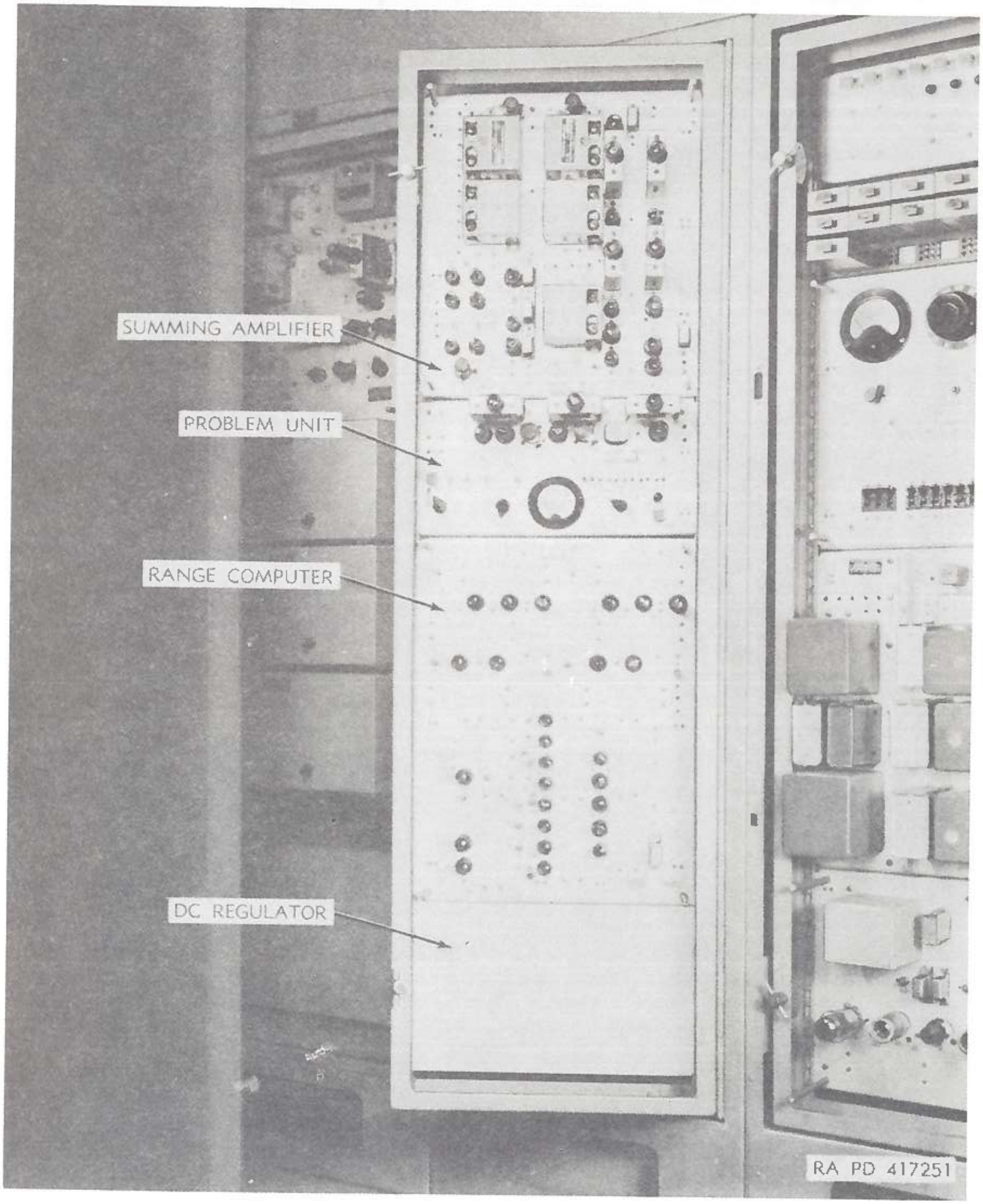


Figure 65. C rack ground slant range computer—front view.

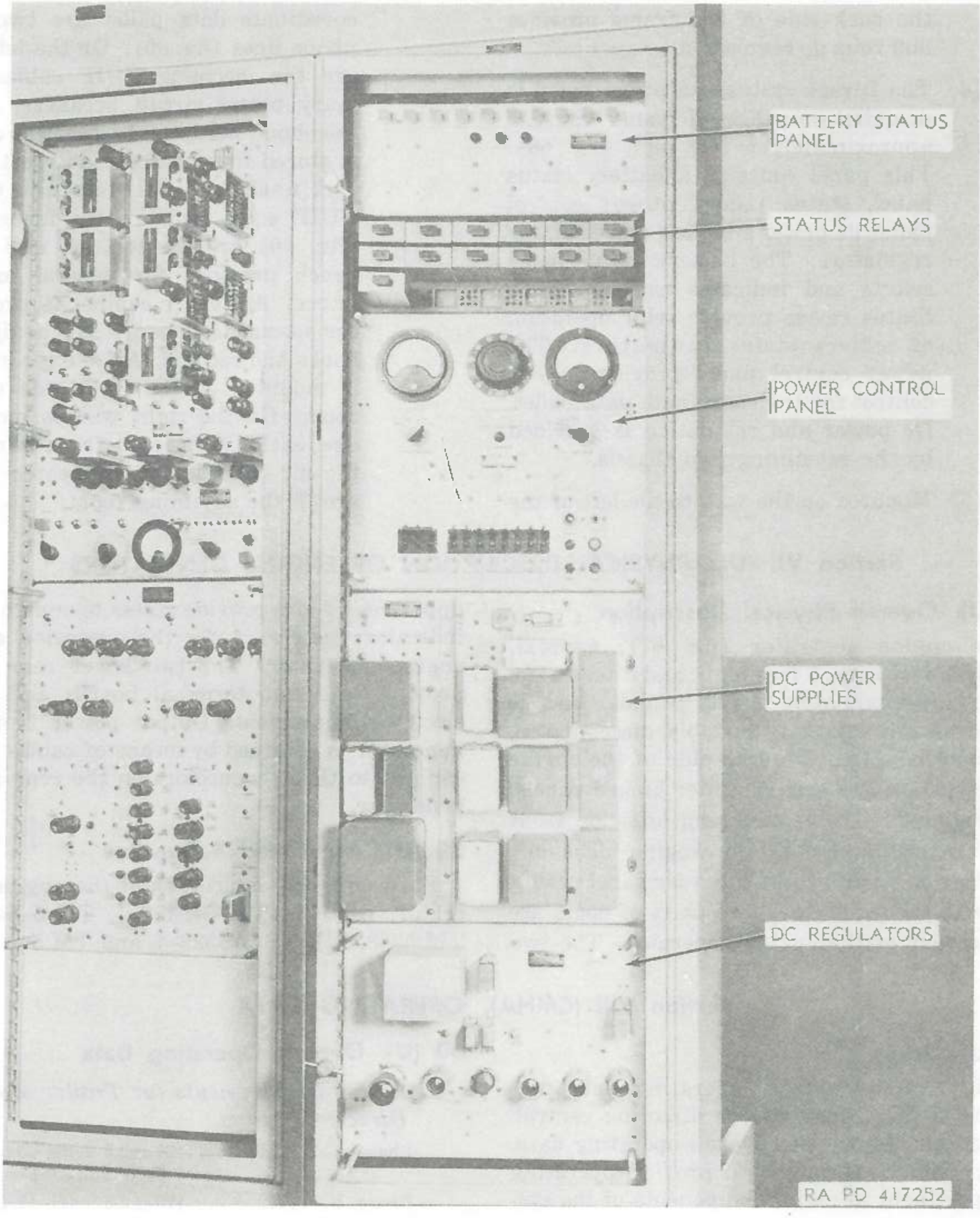


Figure 66. D rack status and power control—front view.

the back side of the frame provides 300 volts dc regulation.

(4) The D rack status and power panel is mounted on a hinged frame which is approximately 6 feet high (fig. 66). This panel contains a battery status panel, status relays, power control panel, dc power supplies, and dc power regulators. The battery status panel selects and indicates battery status. Status relays provide relay operation of battery status indicators. The power control panel provides power control for the coordinate data pallet. Dc power and regulation is provided by the remaining two chassis.

(5) Mounted on the wall to the left of the coordinate data pallet are two telephone lines (fig. 60). On the left wall are the incoming FUIF cables, primary power circuit breakers, and a telephone headset. In the left corner is stored the test scope and test scope cart used for maintenance of the FUIF equipment. In the foreground (fig. 60) are the tool set and work bench provided for general maintenance. A storage cabinet is provided for special tools and FUIF equipment books and records. A fire extinguisher is mounted on the right side of the room. On the right wall is mounted one each thermostat for controlling the air conditioner and heater which are in the adjoining room.

Section VII (U). PHYSICAL DESCRIPTION OF ENGINE GENERATORS

57 (U). Overall Physical Description

The engine generator (fig. 67), approximately 7 feet long, 5 feet high, and 3 feet wide, weighs approximately 4,700 pounds, and is olive drab in color. It is portable, diesel-driven, and skid mounted. On each side of the engine generator are two sets of center hinged panels. The right side front panel and left side front panel permit access to the engine. The left side rear panel and right side rear panel permit access to the generator. Two pairs of doors are on the rear of the engine generator. The two upper rear doors provide access to controls and indicators necessary for the operation of the engine generator. The two lower rear doors provide access to terminal boards and other electrical equipment. Output power from the generator is obtained by means of cables which connect to three connectors on the rear of the generator.

58 (U). Associated References

For a detailed description of the engine generator, refer to TM 5-5432-1, TB 5-5432-1, TM 5-5329-1, TB 5-5329-1, and TM 5-5321-1.

Section VIII (CMHA). OPERATING DATA

59 (U). Scope

This section contains operating data pertaining to the radar course directing central. Paragraph 60 provides overall operating data. Pargraphs 61 through 67 provide operating data pertinent to major components of the system.

60 (U). Overall Operating Data

a. Power Requirements for Trailer Mounted Director Station.

Phase A.............120 ±2.5 volts, 46.5 amps; 5400 volt-amperes

Phase B.............120 ±2.5 volts, 48.4 amps; 5620 volt-amperes

Figure 67. Deleted.

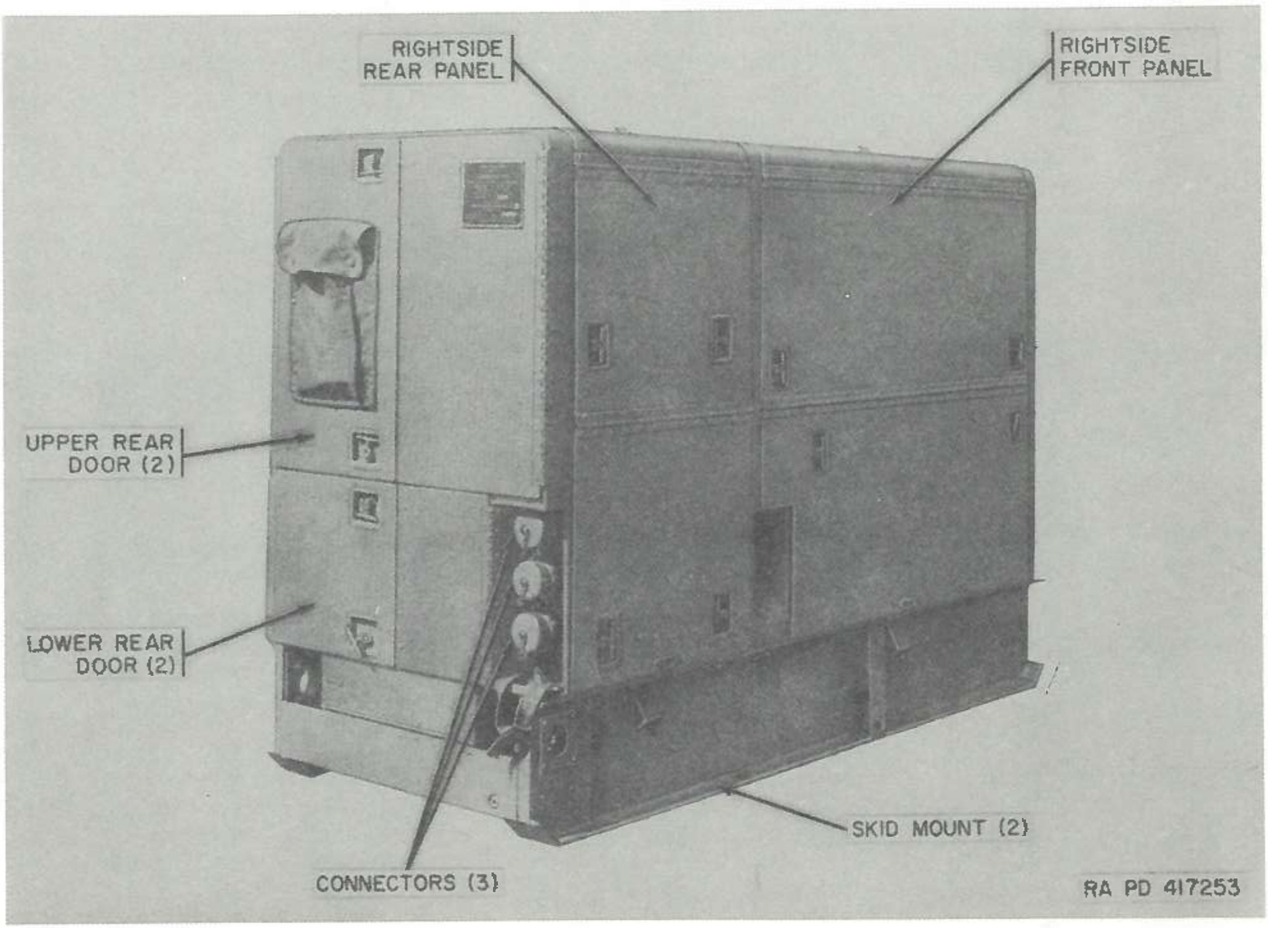


Figure 67 (U). Engine generator—right rear view.

Phase C.............120 volts, 47 amps; 5510 volt-amperes

b. Power Requirements for Trailer Mounted Tracking Station.

Phase A.............120 ±2.5 volts, 57 amps; 6850 volt-amperes

Phase B.............120 ±2.5 volts, 57 amps; 6950 volt-amperes

Phase C.............120 volts, 66 amps; 7920 volt-amperes

Note. Total power required for trailer mounted director station and trailer mounted tracking station is 37.2 kilowatts.

61 (CMHA). Acquisition Radar System Operating Data

a. Antenna System.

Antenna elevation angle ....Variable from 35.5 to 391 mils

Antenna azimuth beam width ....25 mils

Azimuth coverage.....Continuous through 6400 mils

Antenna rotational speed ....5, 10, or 15 rpm

Antenna azimuth drive.3-speed, 400-cps, 3-phase motor

Elevation scan rate...40 seconds (up and down from 35.5 to 391 mils)

Pencil beam range...250,000 yards

Cosecant squared beam range ....175,000 yards

Accuracy ....±150 yards in range, 18 mils in azimuth

Scan condition 1......Pencil beam at 35 mils elevation; beam changing from pencil beam to cosecant squared beam between 35 and 107 mils; cosecant squared beam from 107 to 391 mils. Scans from 35 to 391 mils in automatic scan.

Scan condition 2......Pencil beam from 35 to 107 mils elevation; beam changing from pencil to cosecant squared beeam between 107 and 178 mils; cosecant squared beam from 178 to 391 mils. Scans from 35 to 231 mils in automatic scan.

Scan condition 3.....Pencil beam from 35 to 178 mils elevation; beam changing from pencil beam to cosecant squared beam between 178 and 249 mils; cosecant squared beam from 249 to 391 mils. Scans from 35 to 303 mils in automatic scan.

Scan condition 4......Pencil beam from 35 to 149 miles elevation; beam changing from pencil beam to cosecant squared beam between 249 and 320 mils; cosecant squared beam from 320 to 391 mils. Scans from 35 to 391 mils in automatic scan.

b. Transmitting System.

Transmitter type......Tunable magnetron

Transmitter frequency.3100 to 3500 megacycles

Magnetron current....30 milliamperes

Range ....250,000 yards

c. Presentation System.

PPI ....On battery control console: Ten inch cathode-ray tube with electrostatic deflection; continuous display in range and azimuth of area surrounding the acquisition antenna-receiver-transmitter group. Coverage is 6400 mils in azimuth, and 60,000, 120,000, or 250,000 yards in range.

On target radar control console: Ten inch cathode-ray tube with electro-magnetic deflection; continuous display in range and azimuth of area surrounding the acquisition antenna-receiver-transmitter group. Coverage is 6400 mils in azimuth and 60,000, 120,000, or 250,000 yards in range.

Precision indicator....On battery control console: Modified B-type presentation displaying a sector of the PPI display 8000 yards in range and 533 mils in azimuth centered about intersection of the acquisition (flashing) azimuth line and the acquisition range circle.
On target radar control console: Modified B-type presentation displaying a sector of the PPI display 5000 yards in range and 533 mils in azimuth centered about the electronic cross.

62 (CMHA). Target Tracking and Missile Tracking Radar Systems Operating Data

a. Target Tracking Radar System.

(1) *Antenna system.*
Azimuth limits of operation ......Continuous through 6400 mils
Elevation limits of operation ......−31 to 3231 mils (max)

(2) *Transmitter system.*
Transmitter type..Tunable magnetron
Magnetron frequency ....8500 to 9600 megacycles
Magnetron current ....3 milliamperes
Range ....200,000 yards

(3) *Maximum tracking rates.*
Azimuth and elevation ....750 mils per second
Range ....1300 yards per second

(4) *Maximum slewing rates.*
Azimuth and elevation ....750 mils per second
Range ....18,000 yards per second

(5) *Modes of operation.*
Manual, acquire aided, track aided, and automatic

b. Missile Tracking Radar System.

(1) *Antenna system.*
Azimuth limits of operation ......Continuous from 0 through 6400 mils
Elevation limits of operation ......−31 to 3231 mils (max)

(2) *Transmitter system.*
Transmitter type..Tunable magnetron
Magnetron frequency ....8500 to 9600 megacycles
Magnetron current ....8.5 milliamperes (NIKE-HERCULES) 15 milliamperes (NIKE-AJAX)
Range ....200,000 yards

(3) *Maximum tracking rates.*
Azimuth and elevation ....750 mils per second
Range ....1300 yards per second

(4) *Maximum slewing rates.*
Azimuth and elevation ....750 mils per second
Range ....18,000 yards per second

(5) *Modes of operation.*
Manual, acquire aided, track aided, and automatic

63 (CMHA). Computer System Operating Data

a. Overall System Data.

Type ....DC analog
Inputs ....Slant range, azimuth and elevation of target; slant range, azimuth and elevation of missile. Manually set in radar-to-radar parallax, launcher-to-radar parallax, burst time bias, and height of site. Final dive time used in surface-to-air low altitude and surface-to-surface missions, with height displacement manually set in during a surface-to-sur-

face mission only. Minimum burst altitude used in prime warhead missions.

Outputs ....Roll amount gyro preset information (A_G) G_Y and G_P orders and burst order. Data to recorder group and to plotting boards.

b. System Operational Data Limits.

Settling time..........4 seconds
Time to intercept......0 to 200 seconds
Climb angle...........0 to 1500 mils continuous
Turn angle............−1260 to +1260 mils
Ballistic elevation angle ....−1600 to +1600 mils
Gyro azimuth.........0 to 6400 mils continuous
G_Y and G_P orders......Maximum limits: for NIKE-HERCULES, −7G and +7G for each elevon axis; for NIKE-AJAX, −5G and +5G for each fin axis.
Maximum combined effect is: for NIKE-HERCULES, −7G and +7G; for NIKE-AJAX, −7G and +7G.
Radar-to-radar parallax ....−166 to +166 yards in each rectangular coordinate.
Launcher-to-radar parallax ....−6000 to +6000 yards in each rectangular coordinate.
Burst time bias.......0 to 200 milliseconds
Height of site.........0 to 6000 feet
Height displacement...0 to 100,000 feet
Final dive time.......0 to 100 seconds
Maximum ballistic computer rates:
Time-to-intercept 30 seconds per second slewing for NIKE-HERCULES
15 seconds per second slewing for NIKE-AJAX
4 seconds per second tracking

64 (U). Multichannel Data Recorder Operating Data

Maximum number of channels ....24 (16 in use)
Recording method.....Mirrow galvanometers
Recording medium....Light sensitive paper
Maximum recording period ....200 minutes
Paper footage indication ....Automatic footage indicator and associated indicator light. Light illuminates when 25 feet of paper remain.
Chart speed...........1 foot per minute (0.2 inch per second)

65 (CMHA). Fire Unit Integration Facility System Operating Data

a. Power requirement....3-phase, 208 volts, 400 cps
b. Range ....Determined by distance from integrated system to Army Air Defense Command Post
c. Inputs to FUIF from AADCP.
(1) Type signal......600 cps and 1500 cps pulse code modulation (by wire)
(2) Type information. Friend, Foe, Battery engagement, Remote, Hold fire, and Cease fire
d. Outputs from FUIF to AADCP.
(1) Type signal......600 cps and 1500 cps pulse code modulation (by wire)
(2) Type information. Foe, Target tracked, One, Few, Many, Fire, Effective, Ineffective, Local, Acknowledge, Out of action, X and Y coordinates of tracked target

66 (U). Heating System, Equipment Cooling System and Trailer Lighting System Operating Data

a. Heating System.

Note. Operating data given in this paragraph applies to the trailer mounted director station, trailer mounted tracking station, and the trailer mounted electronic shop.

Normal displacement . . 600 cubic feet per minute when fan is operating at 1900 rpm.

Emergency displacement .... 300 cubic feet per minute when fan is operating at 1200 rpm.

b. Equipment Cooling System.

Displacement .... 2000 cubic feet per minute.

c. Trailer Lighting System.

General illumination . . White, incandescent

Blackout .... Blue, incandescent

Work bench (trailer-mounted tracking station and trailer-mounted electronic shop only. White, incandescent

Emergency .... White, incandescent

Instrument panels ..... Blue-black, flourescent

67 (U). Engine Generators Operating Data

Current output........ 56.3 kilovolt amperes

Output .... 120/208 or 240/416 volts, 400 cps.

Power output......... 45 kilowatts

Note. Refer to TM 5-5432-1, TM 5-5321-1, and TM 5-5329-1 for detailed information on the engine generator.

CHAPTER 4

OPERATING CONTROLS AND INDICATORS OF THE RADAR COURSE DIRECTING CENTRAL

Section I. DESCRIPTION OF CONTROLS AND INDICATORS LOCATED IN THE TRAILER-MOUNTED DIRECTOR STATION

68. Operating Controls and Indicators of Trailer Lighting Equipment, Equipment Cooling System, and Heating Equipment in the Trailer-mounted Director Station

a. Operating Controls and Indicators of the Trailer Lighting Equipment. Controls and indicators of the trailer lighting equipment in the trailer-mounted director station used by operating personnel are on the trailer door light panel (fig. 68), tactical control-indicator on the battery control console, trailer ceiling, and the frame of the main entrance door. All of these controls and indicators are shown on figure 68 and described in the associated legend.

b. Operating Controls and Indicators of the Equipment Cooling System. Controls and indicators of the equipment cooling system in the trailer-mounted director station used by operating personnel are in the utility cabinet and equipment cooling cabinet assembly (fig. 18). These controls and indicators are shown on figure 69, and described in the associated legend.

c. Operating Controls and Indicators of Trailer-Mounted Director Station Heating Equipment. Controls and indicators of the heating equipment in the trailer-mounted director station used by operating personnel are located on the personnel heater. These controls and indicators are shown on figure 69.2 for systems 1086 and below, and figure 69.3 for systems 1087 and above. Description of the controls and indicators is presented in the legend associated with each figure.

69. Operating Controls and Indicators of the Director Station Group

Controls and indicators of the director station group (A, fig. 16) used by operating personnel are on the acquisition power control panel (fig. 19). All these controls and indicators are on the front panel except two behind panel controls. Front panel controls and indicators are discussed in a below. Behind panel controls are discussed in b below.

a. Front Panel Controls and Indicators. The front panel controls and indicators of the acquisition power control panel (fig. 19) are shown on figure 70 and described in the associated legend.

b. Behind Panel Controls. The behind panel controls of the acquisition power control panel (fig. 19) are shown on figure 71, and described in the associated legend.

70. Operating Controls and Indicators of the Recorder Group

Controls and indicators of the recorder group (A, fig. 16) in the trailer-mounted director station used by operating personnel are on the multichannel data recorder (fig. 23), and on the fuse and control panel. These assemblies are discussed in a and b below, respectively.

a. Controls and Indicators of the Multichannel Data Recorder. Controls and indicators of the multichannel data recorder (fig. 23) are shown on figure 72 and described in the associated legend.

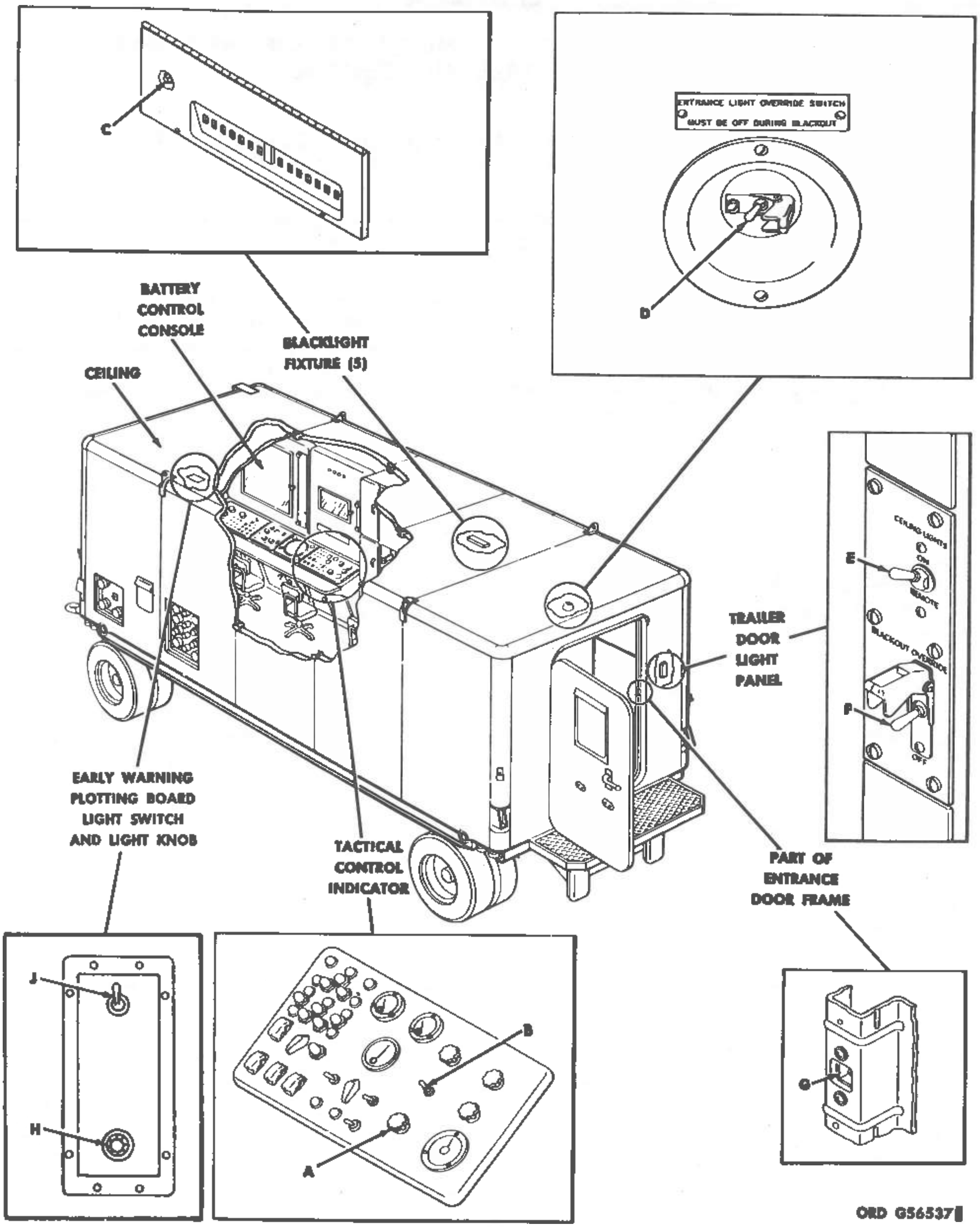


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Figure 68 (U). Trailer-mounted director station—lighting equipment—controls.

Location	Key to fig. 68	Control or indicator	Type	Function
Tactical control-indicator (fig. 68).	A	CEILING LIGHTS knob.	Rotary	When turned, adjusts the brilliance of the white incandescent ceiling lights provided CEILING LIGHTS switch (B, fig. 68) on the tactical control-indicator on the battery control console is set to DIM position, and that the CEILING LIGHTS switch (E, fig. 68) on the trailer door light panel is set to REMOTE position.
	B	CEILING LIGHTS switch.	Toggle (two-position).	When set to the BRIGHT position, illuminates white incandescent ceiling lights at full brilliance provided CEILING LIGHTS switch (E, fig. 68) on trailer door light panel is set to REMOTE position. When set to the DIM position, permits brilliance of white incandescent ceiling lights to be controlled by CEILING LIGHTS knob (A, fig. 68) on the tactical control-indicator on the battery control console, provided CEILING LIGHTS switch (E, fig. 68) on trailer door light panel is set to REMOTE position.
Ceiling (fig. 68)	C	Blacklight light switches (5).	Pushbutton	When depressed, controls fluorescent black light in associated blacklight fixture.
	D	ENTRANCE LIGHT OVERRIDE SWITCH.	Toggle (two-position, with guard).	When set to the ON position, controls white incandescent light in the first incandescent light fixture from door of trailer-mounted director station, provided all other white incandescent lights are illuminated.
Trailer door light panel (fig. 68).	E	CEILING LIGHTS switch.	Toggle (two-position).	When set to the ON position, illuminates all white incandescent ceiling lights at full intensity. When set to the REMOTE position, control of all but two of the white incandescent ceiling lights is transferred to the CEILING LIGHTS switch (B, fig. 68) and CEILING LIGHTS knob (A, fig. 68) on the tactical control-indicator on the battery control console (fig. 68). The two white ceiling lights not controlled remotely are located one in the third incandescent light fixture from the rear of the trailer-mounted director station, and one in the fifth incandescent light fixture. These two lights are extinguished during remote operation.

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Location	Key to fig. 68	Control or indicator	Type	Function
	F	BLACKOUT OVERRIDE switch.	Toggle (two-position, with guard).	When set to the OFF position, causes all the white incandescent ceiling lights to extinguish, and all blue blackout ceiling lights to illuminate when the door of the trailer-mounted director station is opened. When set to the ON position, causes white incandescent ceiling lights and blue blackout ceiling lights to be unaffected by opening and closing of door of trailer-mounted director station.
Entrance door frame (fig. 68).	G	Trailer door interlock switch.	Microswitch	Operates when door of trailer-mounted director station is open, causing white incandescent ceiling lights to extinguish and blue blackout ceiling lights to illuminate, provided BLACKOUT OVERRIDE switch (F, fig. 68) is set to the OFF position.
Ceiling (fig. 68).	H	Early warning plotting board light knob	Rotary	When turned counterclockwise, reduces illumination of the early warning plotting board lights, provided early warning plotting board light switch (J) is set to ON.
	J	Early warning plotting board light switch	Toggle (two-position).	When set to ON, the two early warning plotting board lights illuminate.

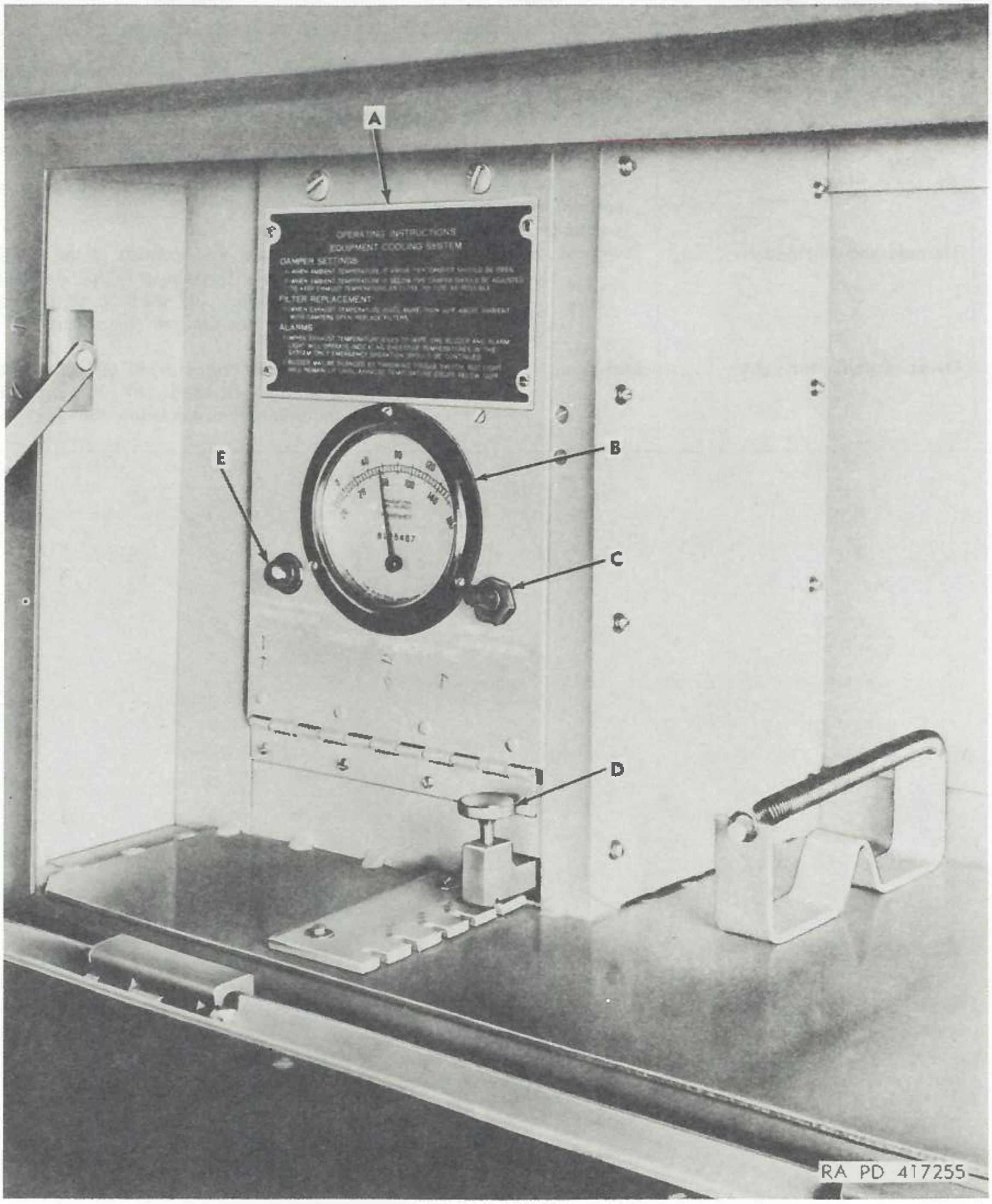


Figure 69. Equipment cooling controls and indicators.

Key to fig. 69	Control or indicator	Type	Function
A	OPERATING INSTRUCTIONS plate.		Provides proper instructions for operation of equipment cooling system. Instructions cover damper settings, filter replacement, and alarms.
B	EXHAUST TEMPERATURE meter.		Indicates temperature of exhaust air from −20° to 180° F. in increments of 5°.
C	Buzzer switch	Toggle (two-position, spring-loaded to up position).	When operated, silences the overheat alarm buzzer
D	Damper and shutter lever	Five-position	Controls air intake and exhaust of the equipment cooling system. Lever may be operated from the CLOSED (pushed in) position to the OPEN (pulled out) position in increments of one-quarter.
E	Overheat indicator light	Red	When illuminated, indicates the temperature of the cooling air has reached 140° F. Extinguishes when temperature drops below 130° F.

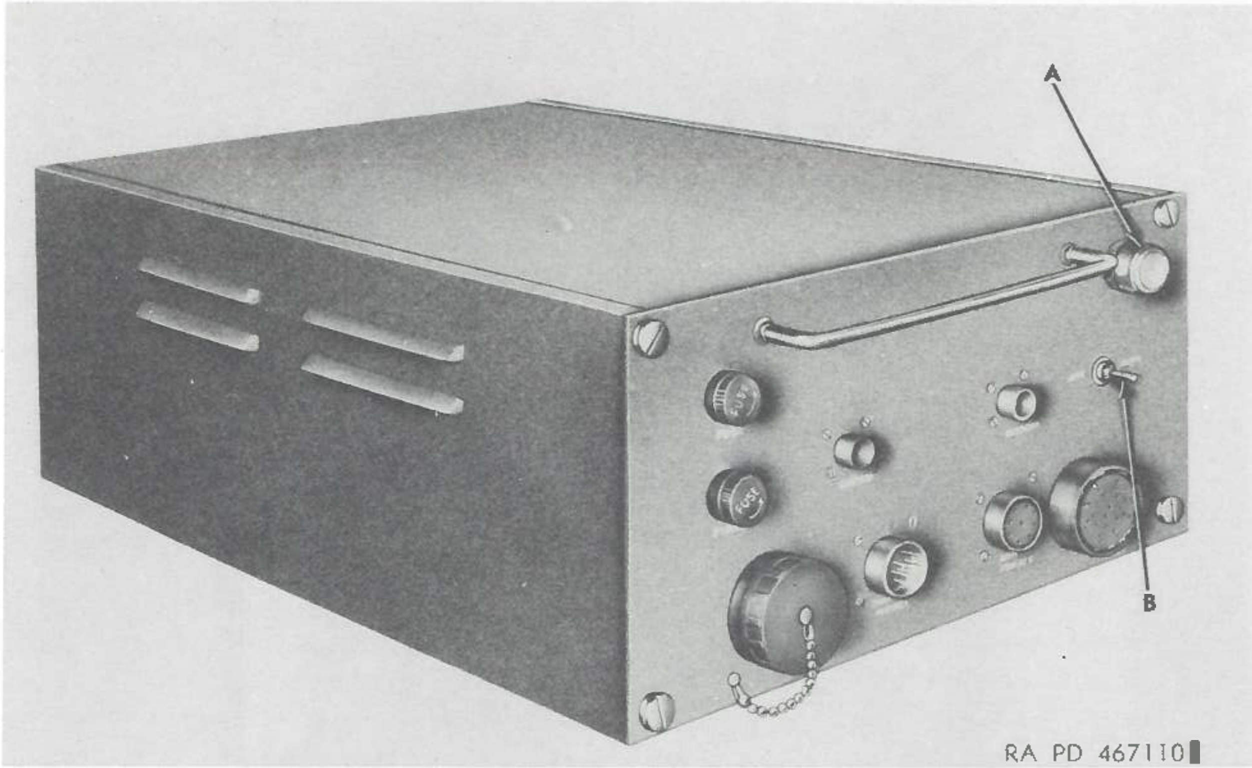


Figure 69.1. Video decoder—controls and indicators.

Key to fig. 69.1	Control or indicator	Type	Function
A	POWER PILOT indicator light	Red (with dimmer).	When illuminated indicates that 110-volt, 400-cycle ac power is being applied to the video decoder.
B	POWER— switch	Toggle (two-position).	When set to ON position, applies single phase, 110-volt, 400-cycle ac power to video decoder power transformer and illuminates the POWER pilot indicator light.

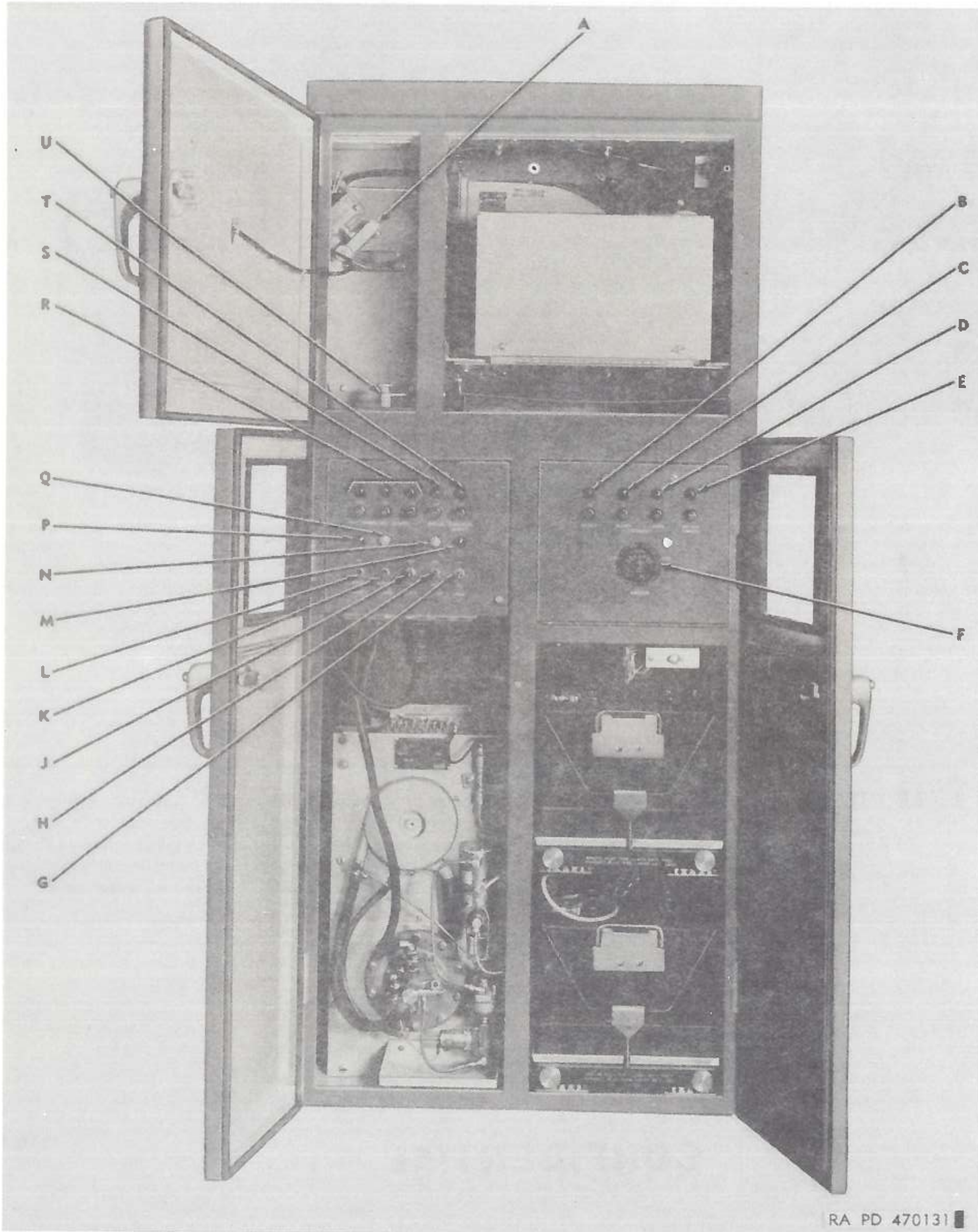


Figure 69.2 Personnel heater - controls and indicators - systems 1086 and below.

Key to fig. 69.2	Control or indicator	Type	Function
A	Blower discharge damper control	Lever	When set to HEAT, prepares ignition system and fuel pump for operation and directs ventilating air down through heater. When set to COOL, disables ignition system and fuel pump, and directs ventilating air up and through ceiling duct.
B	HEATER fuse indicator light	Red	When illuminated, indicates associated fuse has blown.
C	EMERGENCY BLOWER fuse indicator light	Red	When illuminated, indicates associated fuse has blown.
D	EMERGENCY LIGHTS fuse indicator light	Red	When illuminated, indicates associated fuse has blown.
E	BATTERY CHARGER fuse indicator light	Red	When illuminated, indicates associated fuse has blown.
F	AMMETER		Monitors the charging or discharging current of the 24-volt storage batteries.
G	PRIME switch	Toggle (two-position, spring-loaded to down position)	When set to ON, energizes fuel pump which supplies fuel to heater until flame switch heats and PRIME indicator light (M) extinguishes, at which time HEATER switch (H) is set to RUN.
H	HEATER switch	Toggle (three-position)	When set to START, energizes heater to establish initial fuel mixture supply and combustion. When set to RUN, energizes heater to retain fuel mixture supply and combustion for providing burning gases to heat exchanger.
J	OUTPUT switch	Toggle (two-position)	When set to LOW, conditions the normal ventilation blower motor for half-speed operation. When set to HIGH, conditions the normal ventilation blower motor for full speed operation.
K	NORMAL VENT BLOWER switch	Toggle (two-position)	When set to ON, applies 208-volt, 3-phase, 400-cycle power to normal ventilation blower.
L	EMERGENCY VENT BLOWER switch	Toggle (two-position)	When set to ON, applies 24 volts from storage batteries to the emergency ventilation blower motor.
M	PRIME indicator light	Red	When illuminated, indicates fuel pump is energized to supply fuel to heater for initial combustion.
N	HEATER indicator light	White	When illuminated, indicates heater is energized for continuous fuel mixture and combustion.
P	EMERGENCY VENT BLOWER indicator light	Red	When illuminated, indicates emergency ventilation blower motor has been energized for operation.

Key to fig. 69.2	Control or indicator	Type	Function
Q	NORMAL VENT BLOWER indicator light	White	When illuminated, indicates normal ventilation blower motor has been energized for operation.
R	NORMAL VENT BLOWER fuse indicator lights (3)	Red	When illuminated, indicates associated fuse has blown.
S	IGNITION fuse indicator light	Red	When illuminated, indicates associated fuse has blown.
T	COMBUSTION BLOWER fuse indicator light	Red	When illuminated, indicates associated fuse has blown.
U	Blower intake damper control	Lever	When set to No. 1 FRESH AIR, opens fresh air port and closes return air duct to permit only fresh air to be delivered to ventilation blower motors. When set to No. 7 RECIRCULATE, closes fresh air duct and opens return air duct to permit only air from the return air duct to be delivered to ventilation blower motors. When set to one of the intermediate positions, delivers fresh air and air from return air duct to ventilation blower motors in proportional amounts, depending on position of the lever.

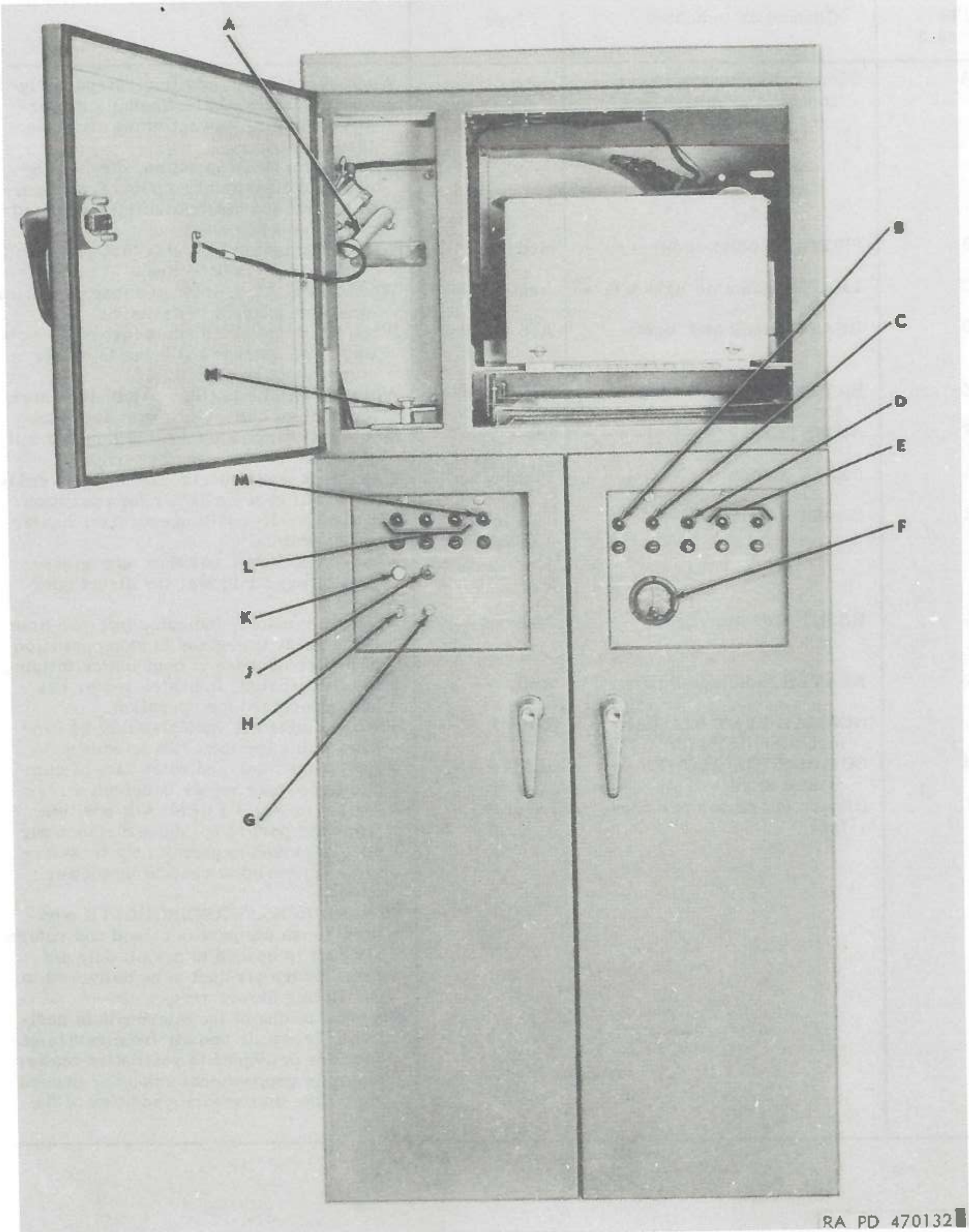


Figure 69.3. Personnel heater - controls and indicators - systems 1087 and above.

Key to fig. 69.3	Control or indicator	Type	Function
A	Blower discharge damper control	Lever - - - -	When set to HEAT position, prepares ignition system and fuel pump for operation and directs ventilating air down through heater. When set to COOL position, disables ignition system and fuel pump from operation and directs ventilating air up and through ceiling duct.
B	SIREN indicator light - - - -	Red - - - - -	When illuminated, indicates fuse of 24-volt line to siren is defective.
C	LIGHTS indicator light (2) - -	Red - - - - -	When illuminated, indicates fuse of trailer emergency lights is defective.
D	HEATER indicator light - - -	Red - - - - -	When illuminated, indicates fuse of 24-volt line from storage batteries to heater components is defective.
E	BATTERY CHARGER indicator lights	Red - - - - -	When either one is illuminated, indicates a defective battery charger line fuse.
F	AMMETER - - - - - - - - - -	DC - - - - - -	Monitors charging or discharging current of the 24-volt storage batteries.
G	RESET switch - - - - - - - -	Pushbutton -	When depressed, resets internal time delay switch to restore heater for operation.
H	HEATER switch - - - - - - -	Toggle (three-position)	When set to ON position, energizes heater for operation. When set to VENT position, energizes ventilating air blower for direct operation.
J	RESET indicator light - - - -	Amber - - - -	When illuminated, indicates internal time delay relay energized to stop operation of heater because of combustion failure.
K	HEATER indicator light - - -	White - - - -	When illuminated, indicates heater has been energized for operation.
L	NORMAL VENT BLOWER indicator lights (3)	Red - - - - -	When illuminated, indicates fuse of ventilation blower motor is defective.
M	COMBUSTION BLOWER indicator light	Red - - - - -	When illuminated, indicates fuse of combustion blower motor is defective.
N	Blower intake damper control	Lever - - - -	When set to No. 1 FRESH AIR position, fresh air port is opened and return air duct is closed to permit only fresh air to be delivered to ventilation blower motor. When set to No. 7 RECIRCULATE position, fresh air port is closed and return air duct is opened to permit only air from return air duct to be delivered to ventilating blower motor. When set to one of the intermediate positions, fresh air and air from return air duct are delivered to ventilation blower motor in proportional amounts, depending on the intermediate position of the lever.

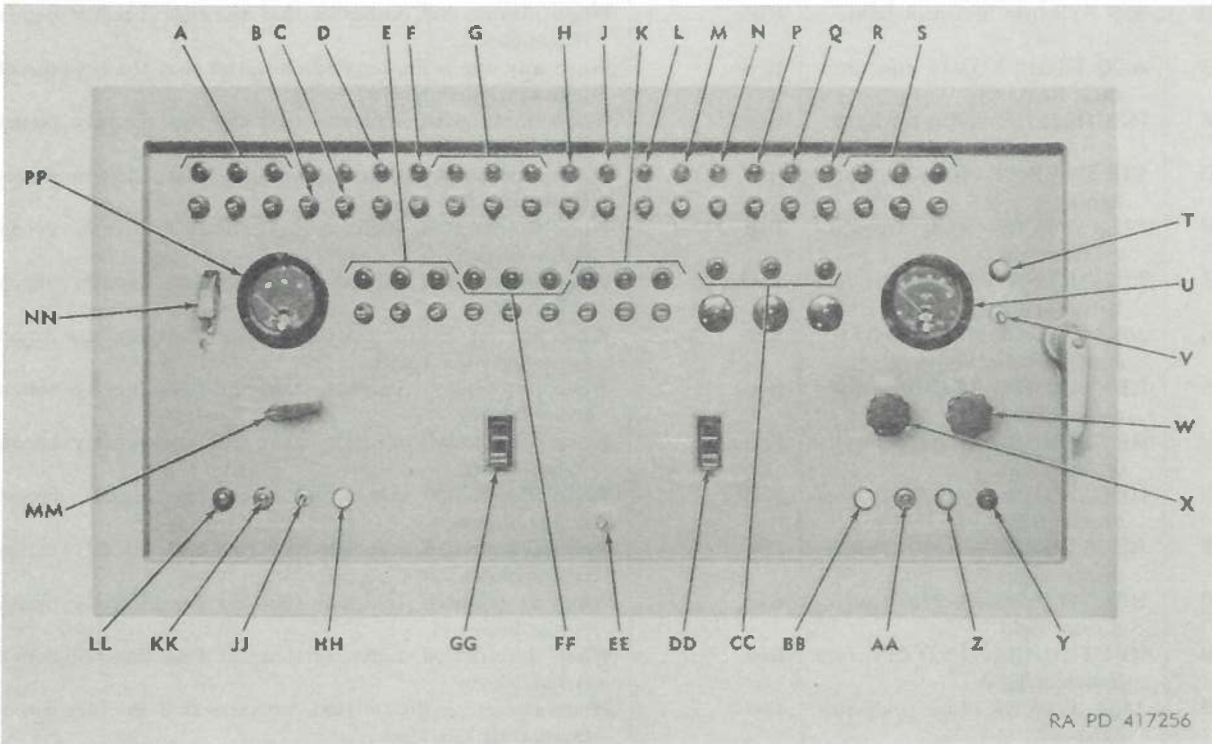


Figure 70. Acquisition power control panel—front panel—controls and indicators.

Key to fig. 70	Control or indicator	Type	Function
A	±1550 fuse indicator lights (3)	Red	When any one is illuminated, indicates that the fuse directly beneath it has blown (after indicator high voltage is applied).
B	UTILITY fuse indicator light	Red	When illuminated, indicates that the fuse directly beneath it has blown.
C	BLK LIGHT fuse indicator light	Red	When illuminated, indicates that the fuse directly beneath it has blown.
D	SIG SYS fuse indicator light	Red	When illuminated, indicates that the fuse directly beneath it has blown.
E	ACQ HIGH VOLTS fuse indicator lights (3).	Red	When any one is illuminated, indicates that the fuse directly beneath it has blown.
F	RECORD fuse indicator light	Red	When illuminated, indicates that the fuse directly beneath it has blown.
G	EQPT VENT fuse indicator lights (3).	Red	When any one is illuminated, indicates that the fuse directly beneath it has blown.
H	FILAMENTS—ACQ fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
J	FILAMENTS—CONSOLE fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
K	AZIMUTH DRIVE MOTOR fuse indicator lights (3).	Red	When any one is illuminated, indicates that the fuse directly beneath it has blown.
L	RECTIFIERS—FIL fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
M	RECTIFIERS—BIAS fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
N	RECTIFIERS— −320v fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
P	RECTIFIERS— +320v fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
Q	RECTIFIERS— +270v fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
R	RECTIFIERS—IND HV fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
S	ACQ POWER fuse indicator lights (3).	Red	When any one is illuminated, indicates that the fuse directly beneath it has blown.
T	TRACK TRANSMITTER FILAMENTS indicator light.	Red	When illuminated, indicates that filament power is being applied to the missile-tracking and target-tracking radar transmitter systems.
U	LINE VOLTS meter		Indicates the magnitude of each phase of the three-phase input line voltage as selected by the position of the PHASE switch (W, fig. 70). Meter scale is graduated from 0 to 150 volts in increments of 5 volts.
V	TRACK TRANSMITTER FILAMENTS switch.	Toggle (two-position).	When turned to the on (up) position, energizes filament circuits in both the missile- and target-tracking radar transmitter systems, and illuminates TRACK TRANSMITTER FILAMENTS indicator light (T, fig. 70).
W	PHASE switch	Rotary (three-position).	When set, its position determines which phase (A, B, or C) of line voltage is monitored on LINE VOLTS meter (U, fig. 70).

Key	Control or indicator	Type	Function
X	ADJUST PHASE C knob	Rotary	When turned, adjusts the magnitude of phase C of the input line voltage as indicated on LINE VOLTS meter (U, fig. 70).
Y	HIGH VOLTS—ON indicator light	Red	When illuminated, indicates that high voltage is being applied to the transmitter system of the acquisition radar system.
Z	HIGH VOLTS—READY indicator light	Green	When illuminated, indicates that high voltage may be applied to the transmitter system of the acquisition radar system.
AA	HIGH VOLTS—HOT indicator light	Amber	When illuminated, indicates that filaments of the high-voltage circuits of the transmitter system of the acquisition radar system are hot.
BB	HIGH VOLTS—PREHEAT indicator light	White	When illuminated, indicates that filament voltage is being applied to entire acquisition radar system. This light remains on for 5 minutes, which is necessary time for filaments to properly heat.
CC	RADAR TRAILER fuse indicator lights (3)	Red	When any one is illuminated, indicates that the fuse directly beneath it is blown.
DD	ACQUISITION POWER switch	Toggle (two-position, heavy duty)	When set to the ON position, applies primary power to acquisition radar system and illuminates INTLK indicator light (LL, fig. 70) immediately; illuminates HIGH VOLTS—PREHEAT indicator light (BB, fig. 70) within 5 seconds; illuminates PLATE VOLTS—READY indicator light (KK, fig. 70) within 20 to 24 seconds.
EE	INTLK OVERRIDE switch	Toggle (two-position, spring-loaded to left position)	When operated to right position, causes all interlock switches of director station group, battery control console, and trailer mounted director station which are associated with the acquisition radar low-voltage system, to be electrically bypassed.
FF	ANT BLOWER fuse indicator lights (3)	Red	When any one is illuminated, indicates that the fuse directly beneath it has blown.
GG	MAIN POWER switch	Toggle (two-position, heavy duty)	When set to the ON position, performs the following functions: *a.* Makes three-phase power available to the acquisition radar and computer system. *b.* Supplies power to the recorder group (A, fig. 16), personnel heater, equipment cooling cabinet assembly, trailer lighting equipment (A, fig. 30), and 110-volt ac outlets (A, B, fig. 16), in the trailer mounted director station. *c.* Supplies power to personnel heater (A, fig. 31), trailer lighting equipment (fig. 38), and 110-volt ac outlets (A, B, fig. 31) in the trailer mounted tracking station. *d.* Supplies power to the 110-volt ac outlets on the missile and target track antenna-receiver-transmitter groups. *e.* Illuminates all ivory tactical control-indicator lights in the trailer mounted director station and the trailer mounted tracking station.
HH	PLATE VOLTS—ON indicator light	White	When illuminated, indicates plate voltage is being applied to all circuits of the acquisition radar system except the high voltage circuits.
JJ	PLATE VOLTS switch	Toggle (two-position)	When turned to the on (up) position, performs the following functions: *a.* Applies plate voltage to all circuits of the acquisition radar system except the high voltage circuits of the magnetron.

Figure 70 (U). Acquisition power control panel—front panel—controls and indicators—legend—continued.

Key	Control or indicator	Type	Function
JJ (cont)			*b.* Illuminates PLATE VOLTS—ON indicator light (HH, fig. 70) and extinguishes PLATE VOLTS—READY indicator light (KK, fig. 70). *c.* Also illuminates HIGH VOLTS—READY indicator light (Z, fig. 70), and MAGNETRON—READY indicator light (PP, fig. 82) on the acquisition control-indicator (fig. 24) on the battery control console, provided filament voltage has been applied to the magnetron high voltage circuits for 5 minutes.
KK	PLATE VOLTS—READY indicator light	Amber	When illuminated, indicates that plate voltage may be applied to all circuits of the acquisition radar system except the transmitter circuits.
LL	INTLK indicator light	Blue	When illuminated, indicates that acquisition radar system interlock circuit is closed. When extinguished, indicates interlock circuit is open or that high voltage is being applied to the transmitter system of the acquisition radar system.
MM	VOLTS CHECK switch	Rotary (12-position)	When set to any one of its 12 positions, except the OFF position, switches the acquisition low voltage power supply output, indicated by the switch setting, to VOLTS CHECK meter (PP, fig. 70) for checking purposes.
NN	BATTLE SHORT switch	Toggle (two-position, with guard)	When turned to the on (up) position, causes the interlock circuits and delay timers in the acquisition radar system to be electrically bypassed.
PP	VOLTS CHECK meter		Indicates the amplitude of the acquisition low voltage power supply output selected by the VOLTS CHECK switch (MM, fig. 70). Scale is graduated in quarter segments.

Figure 70 (U). Acquisition power control panel—front panel—controls and indicators—legend—continued.

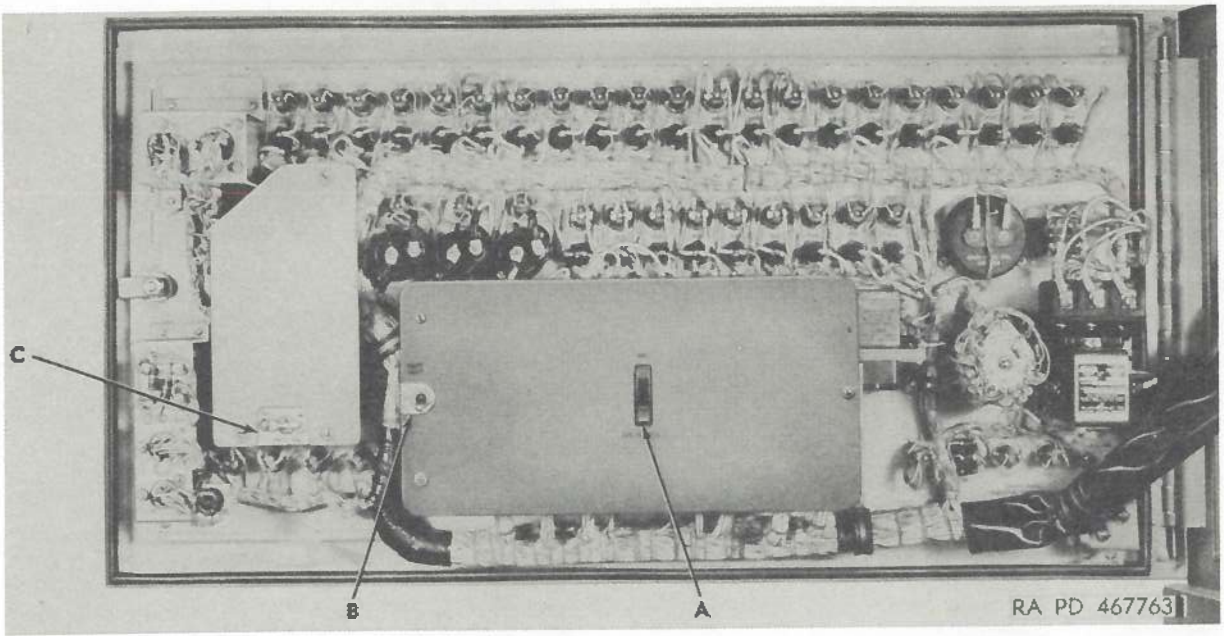


Figure 71 (U). Acquisition power control panel—behind panel controls.

Key to fig. 71	Control	Type	Function
A	ACQ MOTORS switch	Toggle (two-position, heavy duty)	When set to the ON position, energizes the motors and blowers in the acquisition antenna-receiver-transmitter group.
B	EQPT VENT switch	Toggle (two-position)	When turned to the on (up) position, energizes the equipment cooling system in the trailer-mounted director station.
C [1]	VOLTS ADJ switch	Toggle (two-position)	When set to IN position, allows operator to make line volts adjustments in both the director station and the trailer-mounted tracking station. When set to the OUT position, allows operator to make line volts adjustments only from the tracking station. *Note.* The VOLTS ADJ switch is locked in the OUT position for single engine-driven generator operation and locked in the IN position for normal operation.

[1] Used only in systems 1097 and above.

Figure 71.1 (Deleted)

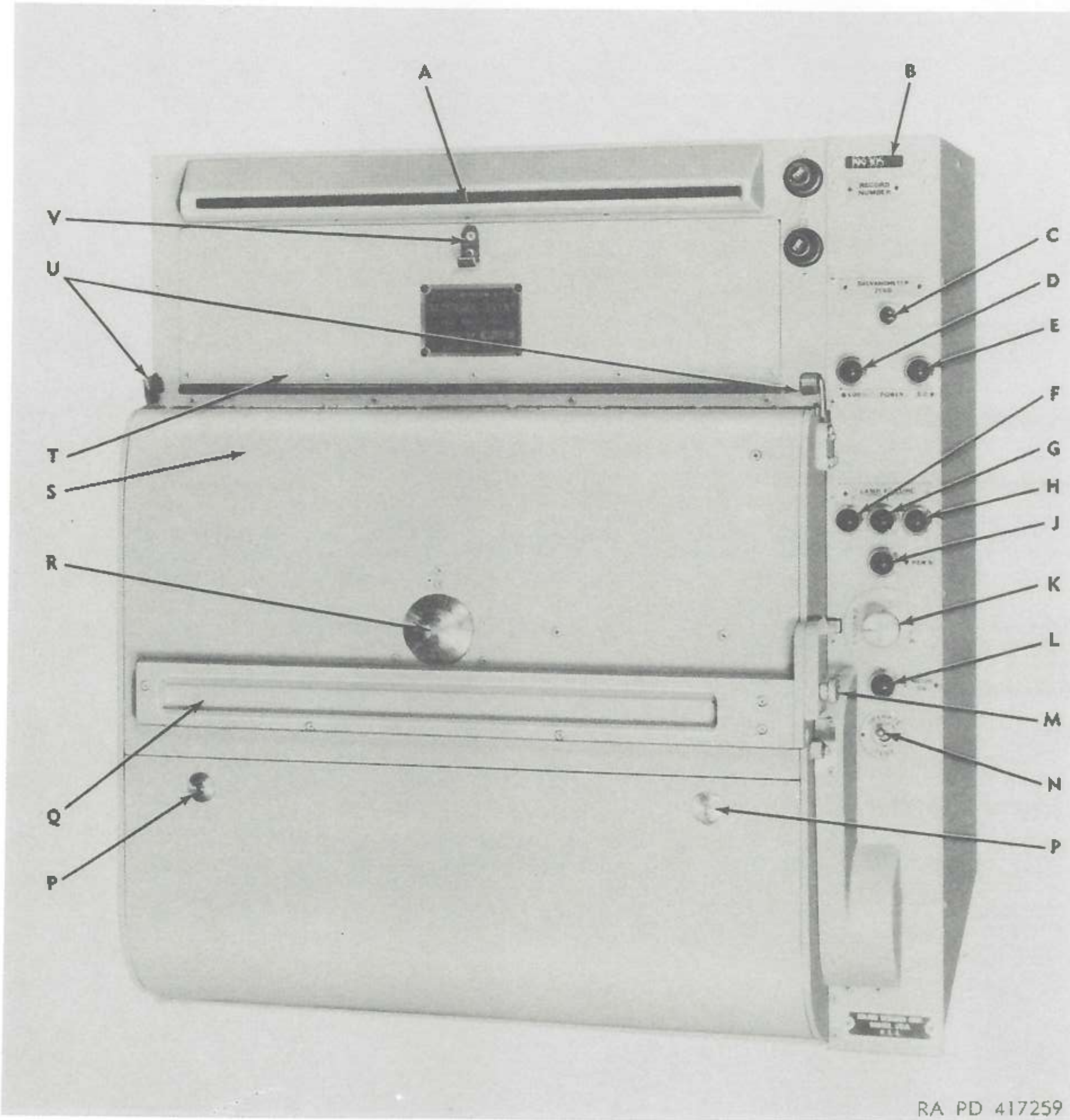


Figure 72. Multichannel data recorder - controls and indicators.

Key to fig. 72	Control or indicator	Type	Function
A	Direct trace monitoring screen	Viewing	Provides means for continuous visual monitoring of trace signals to verify that all recording channels are operating.
B	RECORD NUMBER counter		At start of each record indicates number which will be recorded on recording paper. After approximately 3 seconds, counter is automatically advanced to next consecutive number which will be recorded on recording paper at beginning of next record.
C	GALVANOMETER ZERO switch.	Pushbutton	When depressed, removes all input signals from the recording channel, and records a zero mark on the recording paper.
D	POWER—400~indicator light	Red	When illuminated, indicates 120-volt, 400-cycle power is available at input of multichannel data recorder.
E	POWER—D. C. indicator light	Red	When illuminated, indicates 28-volt dc power is available at input of multichannel data recorder.
F	LAMP FAILURE—T indicator light.	Red	When illuminated, indicates failure of the timer lamp inside the multichannel data recorder.
G	LAMP FAILURE—1 indicator light.	Red	When illuminated, indicates failure of the galvanometer lamp 1 inside the multichannel data recorder.
H	LAMP FAILURE—2 indicator light.	Red	When illuminated, indicates failure of the galvanometer lamp 2 inside the multichannel data recorder.
J	VIEW indicator light	Red	When illuminated, indicates that the RECORD-VIEW switch (K, fig. 72) is in the VIEW position, and that the shutter (Q, fig. 72) can be opened to permit viewing of the galvanometer traces.
K	RECORD-VIEW switch	Rotary (two-position).	When set to the RECORD position, conditions multichannel data recorder for recording data. When set to the VIEW position, permits the shutter (Q, fig. 72) to be opened to permit viewing of galvanometer traces, and deenergizes chart drive motors.
L	MOTOR ON indicator light	Red	When illuminated, indicates that chart drive motor is energized.
M	Shutter knob		When rotated, opens shutter to permit viewing of the galvanometer traces.
N	OPERATE-TEST switch	Toggle (two-position).	When set to the OPERATE position, causes multichannel data recorder to become energized when the equipment status switch (U, 1, fig. 78) on the tactical control-indicator is set to the RED position and a target has been designated. When set to the TEST position, energizes multichannel data recorder.
P	Release buttons	Slide	When actuated, permits opening of associated take-up drum access door and supply drum access door.
Q	Shutter		When opened, permits viewing of galvanometer traces.
R	Film footage counter	Dial	Automatically indicates number of feet of recording paper remaining in supply drum, provided that dial was properly set when multichannel data recorder was loaded.

Key to fig. 72	Control or indicator	Type	Function
S	Supply drum access	Door	When opened, provides access to supply drum.
T	Galvanometer bank access	Door	When opened, provides access to galvanometer bank.
U	Latches	Slide	When actuated, permits take-up drum, supply drum and all associated equipment to open downward to allow access to rear internal equipment of the multichannel data recorder (fig. 23).
V	Latch	Slide	When actuated, permits opening of galvanometer bank access door.

b. Indicator Lights of the Fuse and Control Panel. Indicator lights of the fuse and control panel (fig. 23) associated with the multichannel data recorder are shown on figure 73 and described in the associated legend. Controls and indicators on the fuse and control panel associated with the voice communication system are described in TM 9-1400-251-12.

71. Operating Controls and Indicators of the Battery Control Console

Controls and indicators of the battery-control console (A, fig. 16) used by operating personnel are on the horizontal plotting board (fig. 24), the upper right frame, the battery signal panel-indicator, the tactical control-indicator, the target designate control-indicator, the PPI, the precision indicator, and the acquisition control-indicator. The controls and indicators on each of the above assemblies are described in *a* through *h* below.

a. Horizontal Plotting Board. Controls and indicators of the horizontal plotting board are shown on figure 74 and described in the associated legend.

b. Controls and Indicators on the Upper Right Frame of the Battery Control Console. The controls and indicators of the upper right frame (fig. 24) of the battery control console are all front panel, except for one control behind panel. These are discussed in (1) and (2) below, respectively.

(1) Controls and indicators on the front of the upper right frame of the battery control console are shown on figure 75 and described in the associated legend.

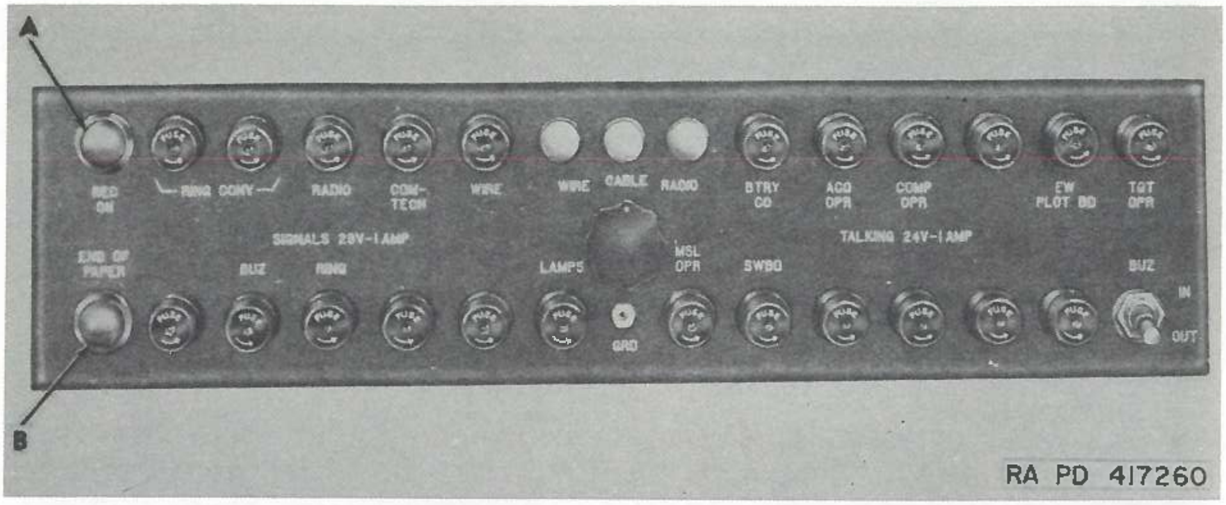
(2) The behind-panel control on the upper right frame (fig. 24) of the battery control console used by operating personnel is shown on figure 76 and described in the associated legend.

c. Controls and Indicators of the Battery Signal Panel-Indicator. Controls and indicators of the battery signal panel-indicator (fig. 24) of the battery control console are shown on figure 77, and described in the associated legend.

d. Control and Indicators of the Tactical Control-Indicator. Controls and indicators of the tactical control-indicator (fig. 24) on the battery-control console are shown on figure 78, and described in the associated legend.

e. Controls and Indicators of the Target Designate Control Indicator. Controls and indicators of the target designate control-indicator (fig. 24) on the battery-control console (A, fig. 16) are shown on figure 79 and described in the associated legend.

f. Controls and Indicators of the PPI. Controls and indicators of the PPI (fig. 24) on the battery-control console (A, fig. 16) used by operating personnel are shown on figure 80 and described in the associated legend.



Key	Control or indicator	Type	Function
A	REC ON indicator light	Amber	When illuminated, indicates that the chart drive motor of the multichannel data recorder is energized.
B	END OF PAPER indicator light	Red	When illuminated, indicates that 25 feet or less of recording paper remains in the supply drum (fig. 23).

Figure 73 (U). Fuse and control panel—indicator lights.

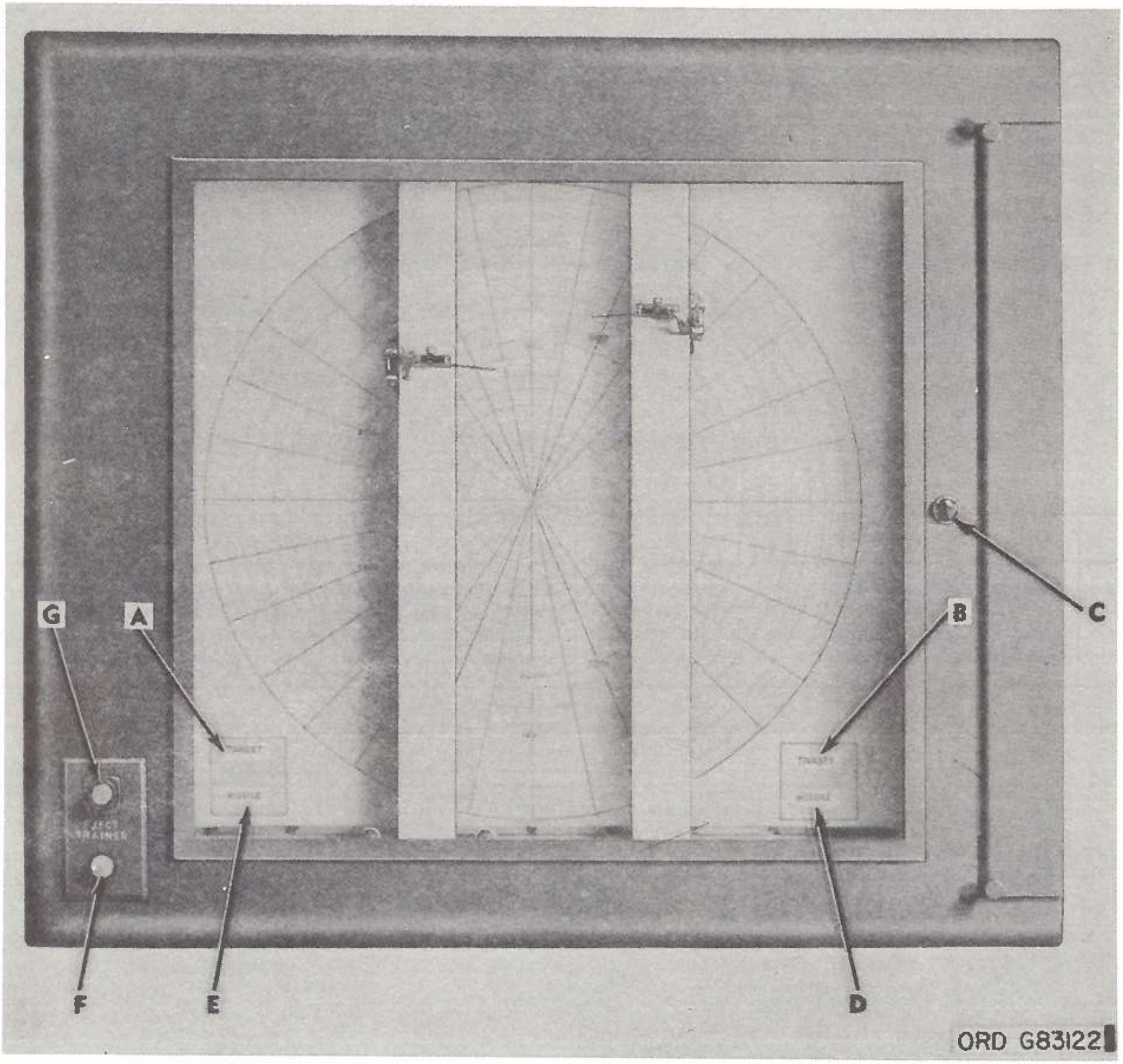
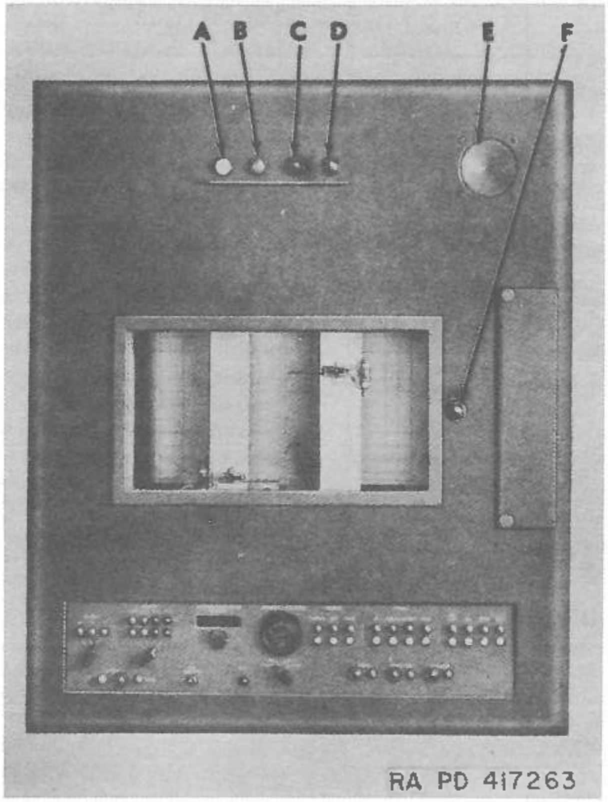


Figure 74. (CMHA). Horizontal plotting board—controls and indicators.

Key	Control or indicator	Type	Function
A	Left TARGET indicator sign		When illuminated, indicates target position information is being plotted by the left recorder pen.
B	Right TARGET indicator sign		When illuminated, indicates target position information is being plotted by the right recorder pen.
C	Window release	Pushbutton	When depressed, releases the horizontal plotting board window latch.
D	Right MISSILE indicator sign		When illuminated, indicates missile position information is being plotted by the right recorder pen.
E	Left MISSILE indicator sign		When illuminated, indicates missile position information is being plotted by the left recorder pen.
F	EJECT TRAINER indicator light	Blue	When illuminated, indicates that radar signal-simulator 15D2 is cabled to the trailer mounted director station, the trailer mounted tracking station or both. When extinguished, indicates that the simulator is not cabled to either trailer.
G	EJECT TRAINER switch	Pushbutton	When depressed, actuates circuits that disconnect radar signal-simulator 15D2 from the trailer mounted director station and the trailer mounted tracking station.

Figure 74 (U). Horizontal plotting board—controls and indicators—legend.



Key	Control or indicator	Type	Function
A	Equipment status indicator light	White	When illuminated, indicates that white equipment status prevails.
B	Equipment status indicator light	Yellow	When illuminated, indicates that yellow equipment status prevails.
C	Equipment status indicator light	Blue	When illuminated, indicates that blue equipment status prevails.
D	Equipment status indicator light	Red	When illuminated, indicates that red equipment status prevails.
E	Loudspeaker	Dynamic	Provides an audible indication when a target return signal appears on the PPI within the preselected sector centered about the steerable azimuth line (fig. 114). The range and azimuth represented by the sector should be set in accordance with TM 9-1430-251-20. The video alarm circuits have been removed in selected systems incorporating the auxiliary acquisition redar (AAR), and the loudspeaker has no functional purpose.
F	Window release	Pushbutton	When depressed, release the altitude plotting board window latch.

Figure 75 (U). Battery control console—partial view—upper right frame controls and indicators—partial.

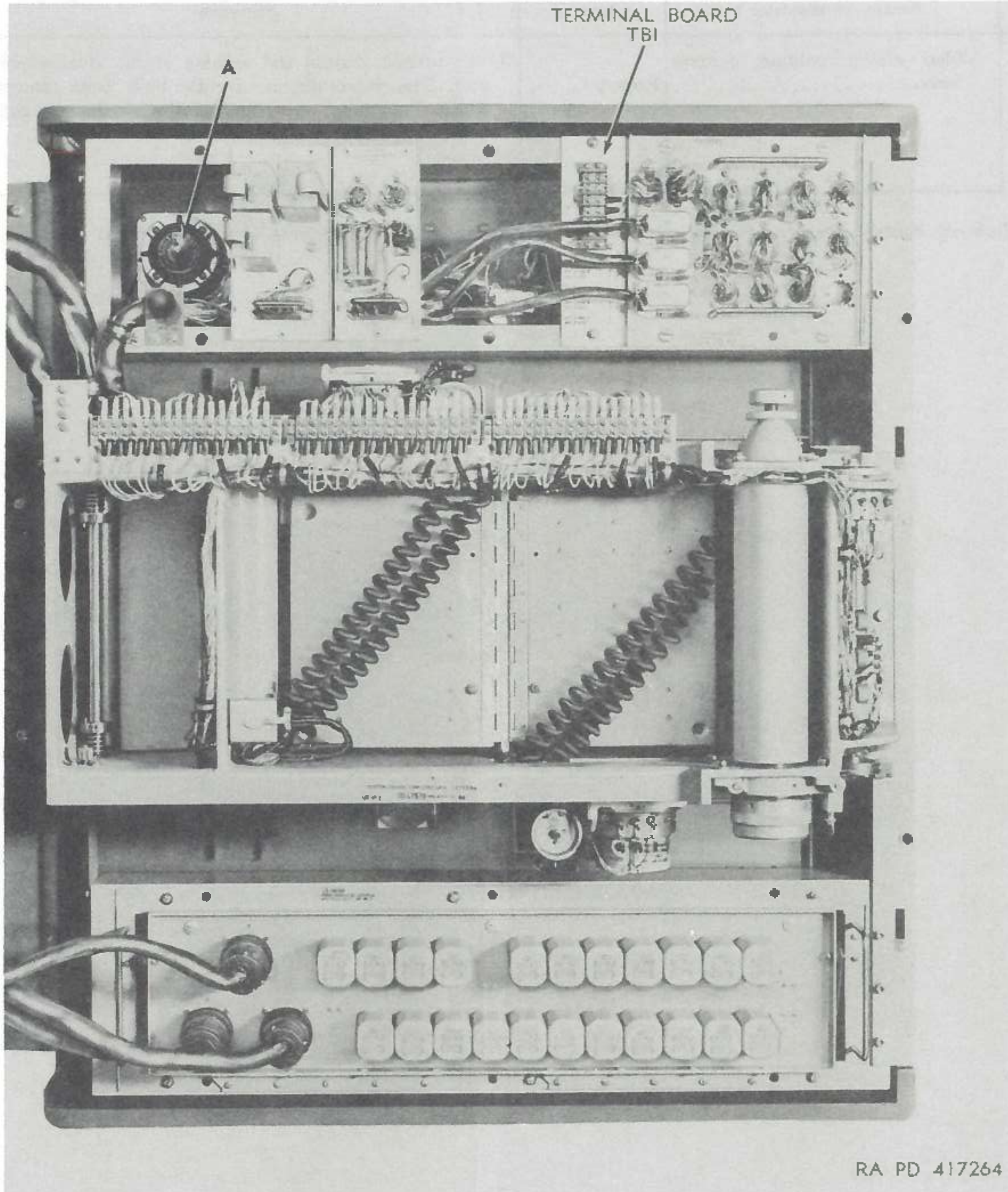


Figure 76. Battery control console—partial view—upper right frame behind panel—controls—partial.

Key to fig. 76	Control or indicator	Type	Function
A	Video alarm volume control knob	Rotary	When turned, adjust the volume of the video alarm circuit. The video alarm circuits have been removed in selected systems incorporating the auxiliary acquisition radar (AAR).

Battery control console—partial view—upper right frame behind panel—controls—partial—legend.

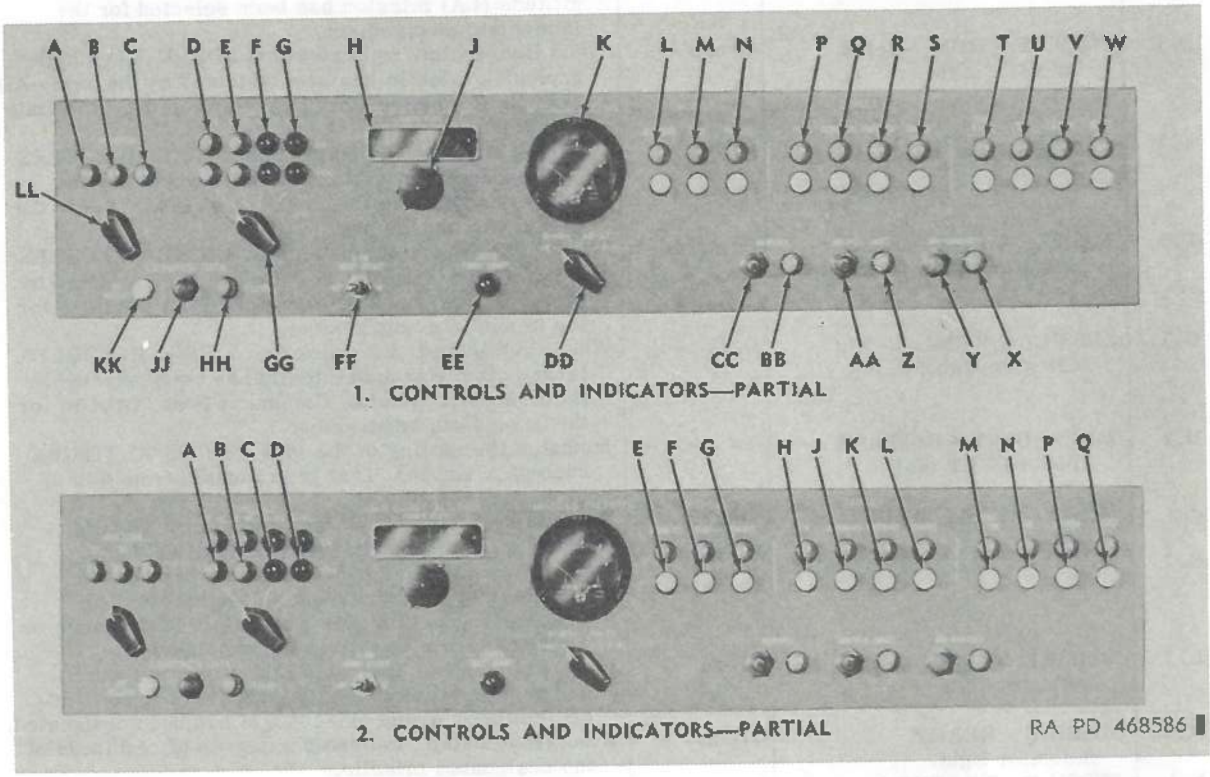


Figure 77. Battery signal panel-indicator - controls and indicators.

Key to fig. 77	Control or indicator	Type	Function
A, 1	MISSION - SS indicator light	Green - -	When illuminated, indicates that a surface-to-surface (SS) mission has been selected for the immediate engagement.
B, 1	MISSION - SA indicator light	Green - -	When illuminated, indicates that a surface-to-air (SA) mission has been selected for the immediate engagement.
C, 1	MISSION - LA indicator light	Green - -	When illuminated, indicates that a surface-to-air low altitude (LA) mission has been selected for the immediate engagement.
D, 1	MISSILE - REM - I-HE indicator light.	Green - -	When illuminated, indicates that a NIKE-AJAX high explosive missile has been selected by the Army Air Defense Command Post (AADCP) for the immediate engagement.
E, 1	MISSILE - REM - B-HE indicator light.	Green - -	When illuminated, indicates that a NIKE-HERCULES high explosive missile has been selected by the Army Air Defense Command Post (AADCP) for the immediate engagement.
F, 1	MISSILE - REM - B-XS indicator light.	Dark red	When illuminated, indicates that a NIKE-HERCULES small prime warhead missile has been selected by the Army Air Defense Command Post (AADCP) for the immediate engagement.
G, 1	MISSILE - REM - B-XL indicator light.	Dark red	When illuminated, indicates that a NIKE-HERCULES large prime warhead missile has been selected by the Army Air Defense Command Post (AADCP) for the immediate engagement.
H, 1	MIN. BURST ALTITUDE 1000's FEET dial.	- - - - - -	Indicates the setting of the MIN. BURST ALTITUDE knob (J, 1, fig. 77). Dial is graduated from 0 to 30 in increments of 0.5.
J, 1	MIN. BURST ALTITUDE knob.	Rotary (with lock)	Permits selection of the minimum burst altitude at which a prime warhead missile will detonate.
K, 1	MISSILES PREPARED meter	- - - - - -	Indicates the number of missiles prepared by the launching area for current setting of MISSILES PREPARED switch (DD, 1, fig. 77). Meter scale is graduated from 0 to 16 in increments of 1.
L, 1	MISSILE - DESIGNATED indicator light.	Green - -	When illuminated, indicates that either the launcher and section from which the missile is to be fired, or simulator group OA-1643/M has been designated.
M, 1	MISSILE - READY indicator light.	Green - -	When illuminated, indicates a degree of readiness of the designated missile.
N, 1	MISSILE - TRACKED indicator light.	Green - -	When illuminated, indicates the designated missile is being tracked by the missile tracking radar system.
P, 1	TARGET - FOE indicator light.	Green - -	When illuminated, indicates that the designated target is hostile.
Q, 1	TARGET - DESIGNATED indicator light.	Green - -	When illuminated, indicates that the identified target has been designated to the target-tracking radar system.
R, 1	TARGET - CONFIRMED indicator light.	Green - -	When illuminated, indicates the designated target is being acquired by the target-tracking radar system.
S, 1	TARGET - TRACKED indicator light.	Green - -	When illuminated, indicates the acquired target is being tracked by the target-tracking radar system.
T, 1	READY TO FIRE indicator light.	Green - -	When illuminated, indicates that the designated missile may be fired at any time.

Key to fig. 77	Control or indicator	Type	Function
U, 1	FIRE indicator light	Green	When illuminated, indicates that the fire order has been issued.
V, 1	LAUNCH indicator light	Green	When illuminated, indicates that the designated missile has been launched.
W, 1	BURST indicator light	Green	When illuminated, indicates that the burst order has been issued.
X, 1	NON-MANEUVER indicator light.	Green	When illuminated, indicates that the computer system is conditioned for a single target that is expected to maneuver little or none at all.
Y, 1	NON-MANEUVER switch	Pushbutton	When depressed, prepares the computer system for a single target that is expected to maneuver little or none at all. Illuminates NON-MANEUVER indicator light (X, 1, fig. 77).
Z, 1	MULTIPLE TARGET indicator light.	Green	When illuminated, indicates that the computer system is so conditioned that the tracking information from a formation is smoothed out and acted upon as single target information to provide reliable target velocity information.
AA, 1	MULTIPLE TARGET switch	Pushbutton	When depressed, conditions the computer system so that the tracking information from a formation is smoothed out and acted upon as single target information to provide reliable target velocity information. Also illuminates MULTIPLE TARGET indicator light (Z, 1 fig. 77).
BB, 1	MANEUVER indicator light	Green	When illuminated, indicates that the computer system is conditioned for a target that is expected to maneuver evasively.
CC, 1	MANEUVER switch	Pushbutton	When depressed, conditions the computer system for a target that is expected to maneuver evasively. Also illuminates MANEUVER indicator light (BB, 1, fig. 77).
DD, 1	MISSILE PREPARED switch	Rotary (four-position).	When set, the number of prepared missiles of the type indicated by its position is indicated on the MISSILES PREPARED meter (K, 1, fig. 77).
EE, 1	LIMITED TARGET DAMAGE indicator light.	Dark red	When illuminated, indicates that the designated target is located such a distance below the minimum burst altitude that the full burst effect from a prime warhead missile cannot be obtained.
FF, 1	B-XW-BURST OFFSET switch	Toggle (two-position).	When set to OUT position, disables the normal burst-offset circuits of the computer system and causes the missile prime warhead to detonate directly on or a short distance from the target. When set to IN position, detonates the missile prime warhead at a distance from the target as determined by the burst-offset circuits of the computer system.
GG, 1	MISSILE switch	Rotary (four-position).	Permits selection of the type missile (I-HE, B-HE, B-XS, or B-XL) to be used for a particular engagement.
HH, 1	LAUNCHER DATA—RELEASED indicator light.	Green	When illuminated, indicates that the mission and missile information, established by the setting of the MISSION switch (LL, 1, fig. 77) aud the MISSILE switch (GG, 1, fig. 77), has been released to the launching area.

Key to fig. 77	Control or indicator	Type	Function
JJ, 1	LAUNCHER DATA switch	Pushbutton	When depressed, releases the mission and missile information established by the setting of the MISSION switch (LL of 1, fig. 77) and the MISSILE switch (GG, 1, fig. 77) to the launching area. Illuminates LAUNCHER DATA—RELEASED indicator light (HH, 1, fig. 77).
KK, 1	LAUNCHER DATA—NOT RELEASED indicator light.	Ivory	When illuminated, indicates that no missile or mission data has been released to the launching area.
LL, 1	MISSION switch	Rotary(three-position push-to-turn- to SS)	Permits selection of the type mission (SS, surface-to-surface; SA, surface-to-air; or LA, surface-to-air low altitude) for a particular engagement.
A, 2	MISSILE—BTRY—I-HE indicator light.	Green	When illuminated, indicates that a NIKE-AJAX high explosive missile has been selected by the battery for the immediate engagement.
B, 2	MISSILE—BTRY—B-HE indicator light.	Green	When illuminated, indicates that a NIKE-HERCULES high explosive missile has been selected by the battery for the immediate engagement.
C, 2	MISSILE—BTRY—B-XS indicator light.	Dark red	When illuminated, indicates that a NIKE-HERCULES small prime warhead missile has been selected by the battery for the immediate engagement.
D, 2	MISSILE—BTRY—B-XL indicator light.	Dark red	When illuminated, indicates that a NIKE-HERBULES large prime warhead missile has been selected by the battery for the immediate engagement.
E, 2	MISSILE—DESIGNATED indicator light.	Ivory	When illuminated, indicates that neither the launcher and section from which the missile is to be fired, nor the flight simulator group has been designated.
F, 2	MISSILE—READY indicator light.	Ivory	When illuminated, indicates that the designated missile or flight simulator group is not ready to be tracked.
G, 2	MISSILE—TRACKED indicator light.	Ivory	When illuminated, indicates that neither a missile nor the flight simulator group is being tracked by the missile tracking radar system.
H, 2	TARGET—FOE indicator light.	Ivory	When illuminated, indicates that no target has currently been identified as hostile.
J, 2	TARGET—DESIGNATED indicator light.	Ivory	When illuminated, indicates that no target has been designated to the target-tracking radar system.
K, 2	TARGET—CONFIRMED indicator light.	Ivory	When illuminated, indicates that no target has been acquired by the target-tracking radar system.
L, 2	TARGET—TRACKED indicator light.	Ivory	When illuminated, indicates that no target is currently being tracked by the target-tracking radar system.
M, 2	READY TO FIRE indicator light.	Ivory	When illuminated, indicates that the events necessary to be performed prior to firing have not taken place.
N, 2	FIRE indicator light	Ivory	When illuminated, indicates that the fire order has not been issued.
P, 2	LAUNCH indicator light	Ivory	When illuminated, indicates that a missile has not been launched for the current engagement.
Q, 2	BURST indicator light	Ivory	When illuminated, indicates that no burst order has been issued.

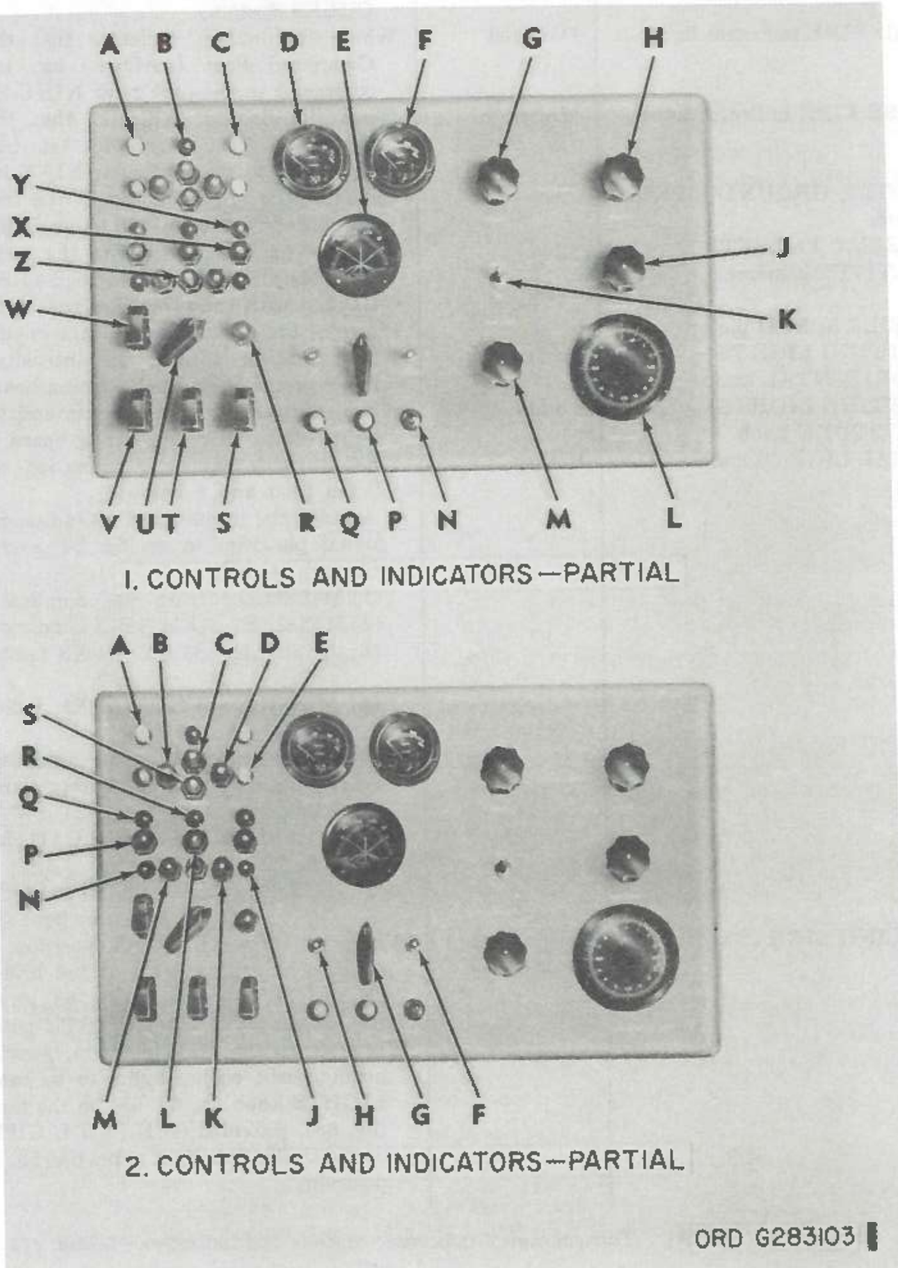


Figure 78 (CMHA). Tactical control-indicator—controls and indicators. (U).

Key	Control or indicator	Type	Function
A, 1	REMOTE indicator light	Yellow	When illuminated, indicates that a command or information is being transmitted from the Army Air Defense Command Post (AADCP) to the particular NIKE-HERCULES System.
B, 1	HOLD FIRE indicator light	Dark red	When illuminated, indicates that the Army Air Defense Command Post (AADCP) has transmitted a hold-fire command to the particular NIKE-HERCULES System.
C, 1	CEASE FIRE indicator light	White	When illuminated, indicates that the Army Air Defense Command Post (AADCP) has transmitted a cease-fire command to the particular NIKE-HERCULES System.
D, 1	TARGET GROUND SPEED meter		Indicates the ground speed of the tracked target. Scale is graduated from 0 to 1500 knots, in increments of 100 knots.
E, 1	PRESENT TARGET ALTITUDE meter		Indicates present altitude of the target being tracked and provides an additional method of correlating target being tracked with the target designated by FUIF.
F, 1	MISSILE SPEED meter		Indicates the ground speed of the missile.
G, 1	PLOTTING LIGHTS—HORIZONTAL knob	Rotary	When rotated, adjusts the intensity of the illuminating lights of the horizontal plotting board (fig. 24).
H, 1	PLOTTING LIGHTS—ALTITUDE knob	Rotary	When rotated, adjusts the intensity of the illuminating lights of the altitude plotting board (fig. 24).
J, 1	SIGNAL LIGHTS knob	Rotary	When turned, adjusts illumination of the indicator lights listed in *a* and *b* below. *a.* Adjusts the intensity of all indicator lights on the battery signal panel-indicator (fig. 24) except those listed in (1) through (4) below. (1) MISSILE—REM—B-XS indicator light (F, 1, fig. 77). (2) MISSILE—REM—B-XL indicator light (G, 1, fig. 77). (3) MISSILE—BTRY—B-XS indicator light (C, 2, fig. 77). (4) MISSILE—BTRY—B-XL indicator light (D, 2, fig. 77). *b.* Adjusts the intensity of all indicator lights on the tactical control-indicator (fig. 24) except those listed in (1) through (3) below. (1) COMPUTER—OVERLOAD indicator light (N, 1, fig. 78). (2) COMPUTER—TEST indicator light (P, 1, fig. 78). (3) GYRO LIMIT indicator light (Q, 1, fig. 78).
K, 1	CEILING LIGHTS switch	Toggle (two-position)	When set to the BRIGHT position, illuminates white incandescent ceiling lights at full brilliance provided CEILING LIGHTS switch (E, fig. 68) on trailer door light panel (fig. 68) is set to the REMOTE position. When set to the DIM position, permits brilliance of white incandescent ceiling lights to be controlled by CEILING LIGHTS knob (A, fig. 68) on the tactical control-indicator (fig. 68), provided CEILING LIGHTS switch (E, fig. 68), on the trailer door light panel (fig. 68) is set to the REMOTE position.

Figure 78 (CMHA). Tactical control-indicator—controls and indicators—legend. (U).

Key	Control or indicator	Type	Function
L, 1	GYRO AZIMUTH indicator	Dial	Indicates the gyro azimuth (A_G) angle of the predicted intercept point from 0 to 6400 mils in increments of 50 mils.
M, 1	CEILING LIGHT knob	Rotary	When turned, adjusts the brilliance of the white incandescent ceiling lights provided CEILING LIGHTS switch (B, fig. 68) on the tactical control-indicator (fig. 68) is set to DIM position, and the CEILING LIGHTS switch (E, fig. 68) on the trailer door light panel (fig. 68) is set to REMOTE position.

Figure 78 (CMHA). Tactical control-indicator—controls and indicators—legend—continued.

Key to fig. 78	Control or indicator	Type	Function
N, 1	COMPUTER—OVERLOAD indicator light.	Amber	When illuminated or flickering, indicates that one or more of the computing amplifiers of the computer system is unbalanced.
P, 1	COMPUTER—TEST indicator light.	Red	When illuminated, indicates the computer system is not in action condition.
Q, 1	GYRO LIMIT indicator light.	Red	When illuminated, indicates that the computer system has calculated a turn angle for the missile, that exceeds the gyro limits of the roll-amount gyro in the missile.
R, 1	SIREN switch	Pushbutton	When depressed, energizes the siren on the trailer-mounted director station.
S, 1	FRIEND switch	Toggle (two-position, spring-loaded to down position, with guard).	When operated to the on (up) position, causes the missile-tracking radar system to stop tracking the missile in flight and return to the next designated missile or flight simulator group and also causes the engagement sequence (foe to burst) for the immediate target to stop, and the NIKE-HERCULES System to return to a detection condition. Extinguishes the green TARGET—FOE indicator light (P, 1, fig. 77) on the battery signal panel-indicator (fig. 24), and illuminates the ivory TARGET—FOE indicator light (H, 2, fig. 77).
T, 1	BURST switch	Toggle (two-position, spring-loaded to down position, with guard).	When operated to the on (up) position, causes the computer to issue a burst order.
U, 1	Equipment status switch	Rotary (four-position).	Performs functions as outlined in *a* through *e* below: *a.* Provides means for selecting WHITE, YELLOW, BLUE, or RED status for the NIKE-HERCULES System. *b.* Illuminates corresponding colored equipment status indicator light on the upper right frame (fig. 24) of the battery control console, and the corresponding colored equipment status indicator light on the middle access door of the target radar control console (fig. 34). *c.* Causes a gong to sound in the trailer-mounted tracking station whenever the position of the switch is changed. *d.* When set to RED position, causes multichannel data recorder (fig. 23) to begin automatic operation provided a target has been designated. *e.* When set to YELLOW, BLUE, or RED position, establishes command and technical hot loop telephone circuits. Refer to TM 9-1400-251-12.

Key to fig. 78	Control or indicator	Type	Function
V, 1	FIRE switch	Toggle (two-position, spring-loaded to down position, with guard).	When operated to the on (up) position, causes the fire order to be issued.
W, 1	MIN BURST ALT OVERRIDE switch.	Toggle (two-position, with guard).	When operated to the on (up) position, cancels the altitude restriction set by the computer's minimum burst altitude circuitry to allow prime warhead missiles to burst below the minimum altitude requirements.
X, 1	MANY switch	Pushbutton	When depressed, causes a signal to be sent to the Army Air Defense Command Post (AADCP) indicating that the target consists of more than five aircraft. Also illuminates the MANY indicator light (Y, 1, fig. 78).
Y, 1	MANY indicator light	Blue	When illuminated, indicates that the Army Air Defense Command Post (AADCP) has been informed that the target consists of more than five aircraft.
Z, 1	KILL switch	Pushbutton	When depressed, indicates to AADCP that the missile has completed a successful mission.
A, 2	LOCAL indicator light	Green	When illuminated, indicates that a signal has been sent to the Army Air Defense Command Post (AADCP) indicating that operating sequence and events for the current engagement will originate from the particular NIKE-HERCULES System.
B, 2	LOCAL switch	Pushbutton	When depressed, causes a signal to be sent to the Army Air Defense Command Post (AADCP) indicating that operating sequence and events for the current engagement will originate from the particular NIKE-HERCULES System.
C, 2	ACKNOW switch	Pushbutton	When depressed, causes a signal to be sent to the Army Air Defense Command Post (AADCP) indicating that the last received signal from the AADCP is acknowledged. Also silences a buzzer which sounds upon receipt of a signal from the AADCP.
D, 2	OUT OF ACTION switch	Pushbutton	When depressed, causes a signal to be sent to the Army Air Defense Command Post (AADCP) indicating that the particular NIKE-HERCULES System is incapable of normal action until further notice. Illuminates OUT OF ACTION indicator light (E, 2, fig. 78).
E, 2	OUT OF ACTION indicator light.	Yellow	When illuminated, indicates that the particular NIKE-HERCULES System is incapable of normal action until further notice.
F, 2	PEN INTERCHANGE switch.	Toggle (two-position, spring-loaded to down position).	When operated to the on (up) position and released, causes recorder pens of horizontal plotting board to interchange the data they are currently plotting, provided the COMPUTER CONDITION switch (PP, fig. 84) on the computer control-panel (fig. 28) is set to PRELAUNCH & INITIAL TURN position, and the plotting board condition switch (G, 2, fig. 78) is in any position except REF MARK position or STANDBY position.

Key to fig. 78	Control or indicator	Type	Function
G, 2	Plotting board condition switch	Rotary (five-position).	Permits selection of mode of operation (REF MARK; STANDBY; OPERATE; PLOT; TEST) to be performed by horizontal plotting board and altitude plotting board.
H, 2	PEN LIFT switch	Toggle (two-position, spring-loaded to down position).	When depressed, if plotting board condition switch (G, 2, fig. 78) is set to PLOT position, and recorder pens are down, causes recorder pens to lift from plotting surfaces of horizontal plotting board and altitude plotting board.
J, 2	INEFFECTIVE indicator light.	Blue	When illuminated, indicates that the Army Air Defense Command Post (AADCP) has been informed that the engagement against the designated target was unsuccessful.
K, 2	INEFFECTIVE switch	Pushbutton	When depressed, causes a signal to be sent to the Army Air Defense Command Post (AADCP) indicating that the engagement against the designated target was unsuccessful. Also illuminates INEFFECTIVE indicator light (J, 2, fig. 78).
L, 2	FEW switch	Pushbutton	When depressed, causes a signal to be sent to the Army Air Defense Command Post (AADCP) indicating that the target consists of two to five aircraft. Also illuminates FEW indicator light (R, 2, fig. 78).
M, 2	EFFECTIVE switch	Pushbutton	When depressed, causes a signal to be sent to the Army Air Defense Command Post (AADCP) indicating that the engagement against the designated target was successful. Also illuminates EFFECTIVE indicator light (N, 2, fig. 78).
N, 2	EFFECTIVE indicator light	Blue	When illuminated, indicates that the Army Air Defense Command Post (AADCP) has been informed that the engagement against the designated target was successful.
P, 2	ONE switch	Pushbutton	When depressed, causes a signal to be sent to the Army Air Defense Command Post (AADCP) indicating that the target consists of a single aircraft. Also illuminates ONE indicator light (Q, 2, fig. 78).
Q, 2	ONE indicator light	Blue	When illuminated, indicates that the Army Air Defense Command Post (AADCP) has been informed that the target consists of a single aircraft.
R, 2	FEW indicator light	Blue	When illuminated, indicates that the Army Air Defense Command Post (AADCP) has been informed that the target consists of two to five aircraft.
S, 2	VALIDITY switch	Pushbutton	When depressed, causes a signal to be sent to the Army Air Defense Command Post (AADCP) requesting a verification of the target designation sent from the AADCP.

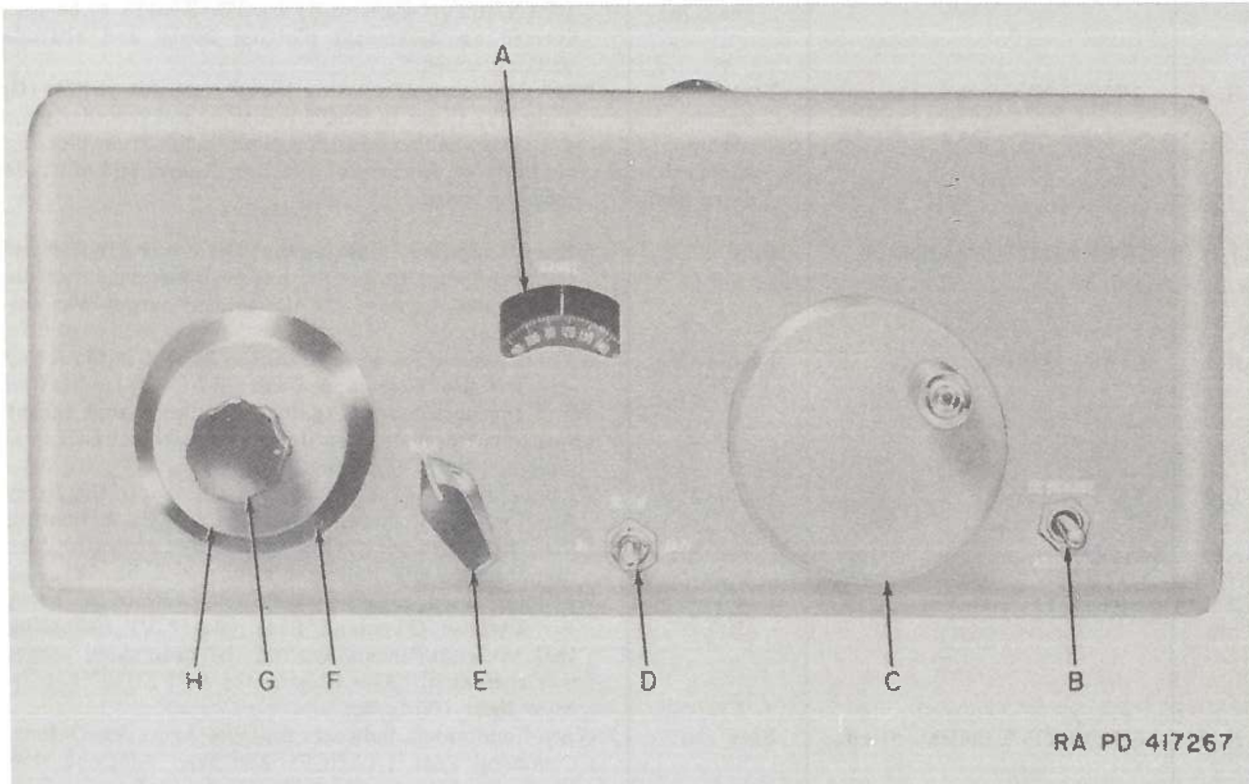


Figure 79. (U). Target designate control indicator—controls and indicators (U).

Key to fig. 79	Control or indicator	Type	Function
A	RANGE dial		Indicates in yards the range represented on the PPI (fig. 24) on the battery control console by the setting of the acquisition range circle (F, fig. 113). On production systems 1049 and up, the dial is graduated from 0 to 250, representing 0 to 250,000 yards, in increments of 2,000 yards.
B	DESIGNATE-ABANDON switch.	Toggle (three-position, spring-loaded to center position).	When operated to the DESIGNATE position, energizes a buzzer in the target radar control console (A, fig. 31) in the trailer-mounted tracking station, which indicates that a new target is being designated for tracking by the target-tracking radar system. Illuminates the green TARGET-DESIGNATED indicator light (Q, 1, fig. 77) and extinguishes the ivory TARGET-DESIGNATED indicator light (J, 2, fig. 77) on the battery signal panel-indicator (fig. 24) on the battery control console. Also illuminates the green DESIGNATE indicator light (A, fig. 92) and extinguishes the ivory DESIGNATE indicator light (M, fig. 92) on the target-track indicator assembly (fig. 34) on the target radar control console.

Key to fig. 79	Control or indicator	Type	Function
			When operated to ABANDON position, extinguishes the green TARGET-DESIGNATED indicator light (Q, 1, fig. 77) and illuminates the ivory TARGET-DESIGNATED indicator light (J, 2, fig. 77) on the battery signal panel-indicator (fig. 24) on the battery-control console. Also extinguishes the green DESIGNATE indicator light (A, fig. 92) and illuminates the ivory DESIGNATE indicator light (M, fig. 92) on the target track indicator assembly (fig. 34) on the target radar control console indicating that the target currently being tracked is to be abandoned. The abandon circuits are inoperative from the time a fire command is initiated until missile burst signal is received.
C	Range handwheel	Rotary	When rotated, adjusts the position of the acquisition range circle (F, fig. 113) as displayed on the PPI (fig. 24) on the battery-control console.
D	Range SLEW switch	Toggle (three-position, spring-loaded to center position).	When operated, moves the acquisition range circle (F, fig. 113) on the PPI (fig. 24) on the battery-control console in or out in range at a more rapid rate than is provided by rotating the range handwheel (C, fig. 79).
E	Range MAN-AID switch	Rotary (two-position).	When set to MAN position, permits the acquisition range circle (F, fig. 113), as displayed on the PPI (fig. 24) on the battery-control console, to be positioned in or out in range at a rate directly proportioned to the manual rotation of the range handwheel (C, fig. 79). When set to AID position, permits the acquisition range circle (F, fig. 113), as displayed on the PPI (fig. 24) on the battery-control console, to continue to move in or out in range automatically after manual release of the range handwheel (C, fig. 79). The rate at which the acquisition range circle moves remains the same as it was at the time the range handwheel was released.
F	Azimuth switch	Ring depress	When depressed, all existing displays on the PPI (fig. 24) on the battery control console are removed, and an acquisition range mark (D, fig. 113) and a steerable azimuth line (fig. 114) are displayed.
G	Azimuth knob (fine)	Rotary (top)	When turned, permits precision positioning of the acquisition (flashing) azimuth line (A, fig. 115) displayed on the precision indicator (fig. 24) and the acquisition (flashing) azimuth line (E, fig. 113) displayed on the PPI (fig. 24) on the battery control console.
H	Azimuth knob (coarse)	Rotary (bottom)	When turned, permits coarse positioning of the acquisition (flashing) azimuth line (A, fig. 115) displayed on the precision indicator (fig. 24) and the acquisition (flashing) azimuth line (E, fig. 113) displayed on the PPI (fig. 24) on the battery control console.

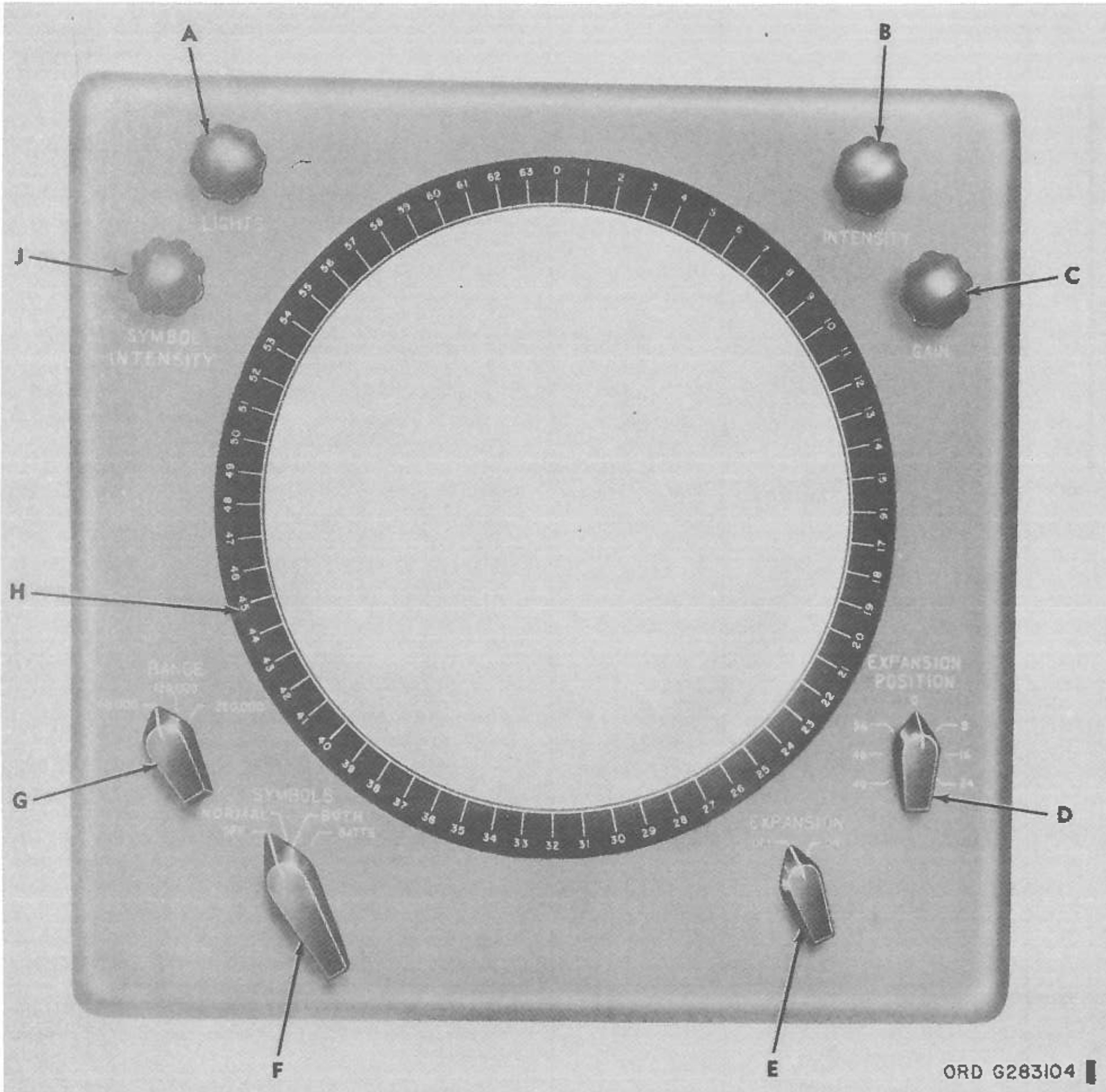


Figure 80 (CMHA). PPI (battery control console)—controls and indicators. (U).

Key	Control or indicator	Type	Function
A	LIGHTS knob	Rotary	When turned, adjusts the illumination of azimuth scale (H, fig. 80) on the PPI (fig. 24).
B	INTENSITY knob	Rotary	When turned adjusts the intensity of all displays shown on the face of the PPI scope (fig. 24).
C	GAIN knob	Rotary	When turned, adjusts the intensity of all displays on the PPI (fig. 24) except the acquisition (flashing) azimuth line (E, fig. 113), the rotating radial sweep (C, fig. 113), and the steerable azimuth line (fig. 114).
D	EXPANSION POSITION knob	Rotary	When turned, positions the origin of the rotating radial sweep (C, fig. 113) from 0 to 6400 mils around the outer edge of the PPI (fig. 24), provided the EXPANSION switch (E, fig. 80) is set to the ON position. The six positions engraved on the panel are for reference to aid in positioning the origin of the rotating radial sweep.
E	EXPANSION switch	Rotary (two-position)	When set to ON position, moves the origin of the rotating radial sweep (C, fig. 113) from the center to the outer edge of the PPI (fig. 24). When set to OFF position, places the origin of the rotating radial sweep (C, fig. 113) at the center of the PPI (fig. 24).
F	SYMBOLS switch	Rotary (four-position, spring-loaded to center from right)	When set to OFF position, displays normal acquisition video only on the PPI (fig. 24). When set to NORMAL position, displays on the PPI (fig. 24) normal acquisition video and various symbols (par. 84*a*) transmitted from the Army Air Defense Command Post (AADCP) to the particular NIKE-HERCULES System. When operated to BATTS position, removes the various symbols (par. 84*a*) transmitted from the Army Air Defense Command Post (AADCP) to the particular NIKE-HERCULES System and normal acquisition video and battery symbols only remain on the PPI (fig. 24). When operated to BOTH, displays normal acquisition video and both FUIF symbols and FUIF battery symbols simultaneously (par. 130 *a* and *b*).
G	RANGE switch	Rotary (three-position)	When set, displays on the PPI (fig. 24) only those targets and objects within the range determined by the setting (60,000, 120,000, and 250,000 yards) of the switch.
H	Azimuth scale	Dial	Provides a means for determining the azimuth of any display appearing on the PPI (fig. 24). Scale is graduated from 0 to 6400 mils in increments of 100 mils.
J [1]	SYMBOL INTENSITY knob	Rotary	When turned, adjusts brilliance of symbols displayed on the PPI.

[1] Applies to systems 1307 and above and systems that have MWO ORD Y28-W29 installed.

Figure 80 (CMHA). PPI (battery control console)—controls and indicators—legend (U).

g. Controls and Indicators of the Precision Indicator. Controls and indicators of the precision indicator (fig. 24) on the battery control console (A, fig. 16) used by operating personnel are shown on figure 81 and described in the associated legend.

h. Controls and Indicators of the Acquisition Control-Indicator. Controls and indicators of the acquisition control-indicator (fig. 24) on the battery control console (A, fig. 16) used by operating personnel are shown on figure 82 and described in the associated legend. Control differences in systems with anti-jam display (AJD) capabilities are shown on figure 82.1 and described in the associated legend.

72 (U). Operating Controls and Indicators of the Computer Power Supply Group

Controls and indicators of the computer power supply group (B, fig. 16) in the trailer mounted director station used by operating personnel are on the computer power control panel (fig. 27). These controls and indicators are shown on figure 83 and described in the associated legend.

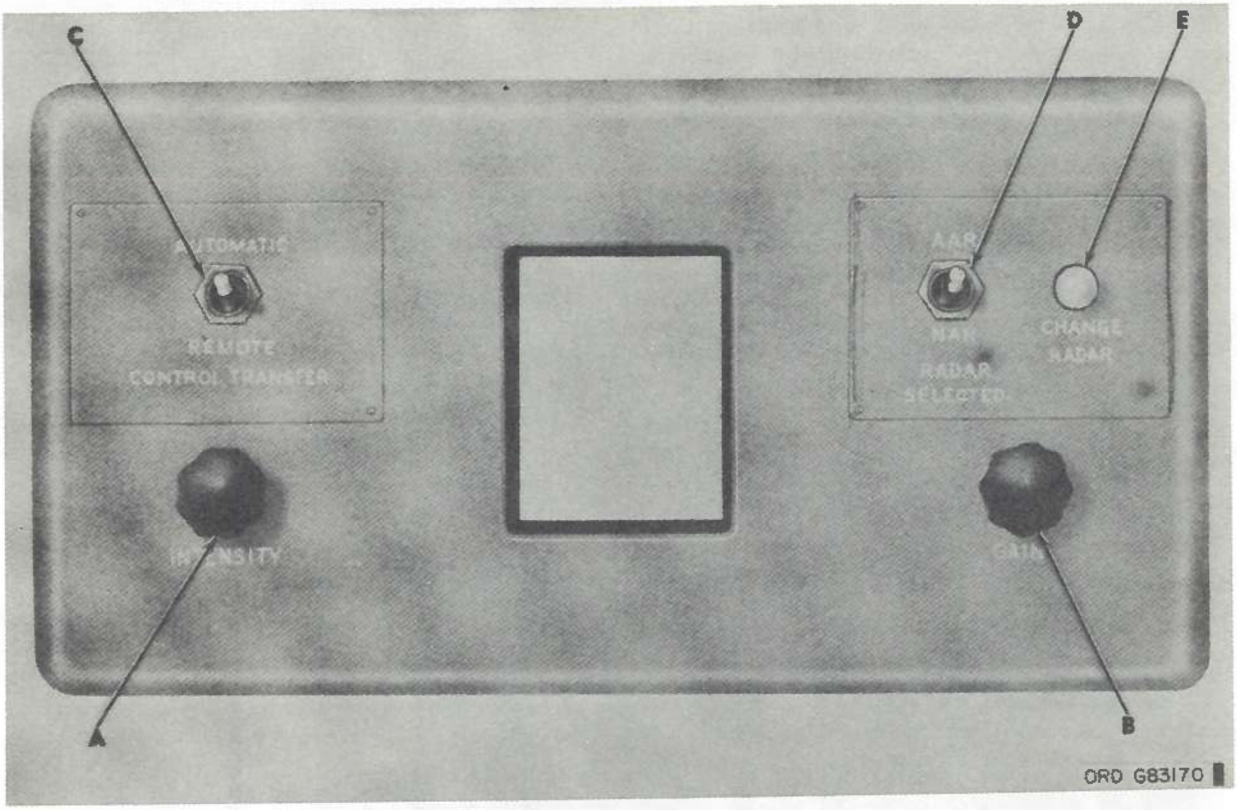
73 (U). Operating Controls and Indicators of the Servo Computer Assembly

Controls and indicators of the servo computer assembly (B, fig. 16) in the trailer mounted director station used by operating personnel are on the computer control-panel, behind the lower compartment doors, and in the upper compartment. These controls and indicators are discussed in *a* through *c* below.

a. Operating Controls and Indicators of the Computer Control-Panel. Controls and indicators of the computer control-panel (fig. 28) are shown on figure 84 and described in the associated legend.

b. Indicator Dials Viewed Through Lower Compartment Doors of the Servo Computer Assembly. The indicator dials (fig. 28) viewed through the lower compartment doors of the servo computer assembly are shown on figure 85 and described in the associated legend.

c. Operating Controls and Indicators in the Upper Compartment of the Servo Computer Assembly. Controls and indicators in the upper compartment (fig. 28) of the servo computer assembly are shown on figure 86 and described in the associated legend.



Key to fig. 81	Control	Type	Function
A	INTENSITY knob..........	Rotary	When turned, adjusts the brightness of all displays on the face of the precision indicator (fig. 115).
B	GAIN knob.................	Rotary	When turned, adjusts the intensity of the entire display (fig. 115) except the sweep (B, fig. 115) on the precision indicator (fig. 24) on the battery control console.
C	CONTROL TRANSFER switch (selected systems only)	Toggle	Provided for future use.
D	RADAR SELECTED switch (selected systems only).....	Toggle	When set to the NAR position, selects Nike acpuisition radar video for display on the PPIs and precision indicators. When set to the AAR position, selects auxiliary acquisition radar (AAR) video for display on the PPIs and precision indicators. When set to either position, causes CHANGE RADAR indicator light to extinguish.
E	CHANGE RADAR indicator light (selected systems only) .		Provided for future use.

Figure 81 (U). Precision indicator—(battery-control console)—controls and indicators—legend.

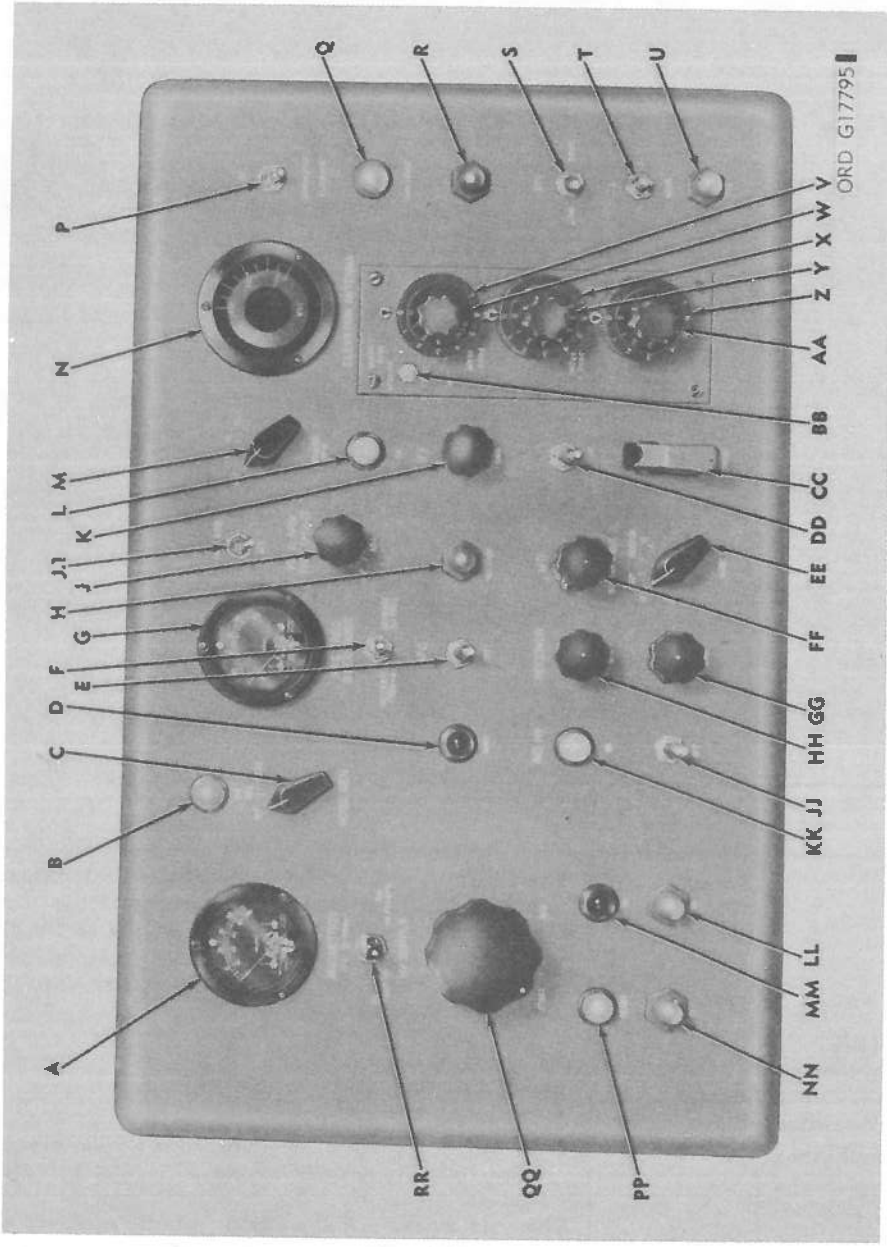


Figure 82 (CMHA). Acquisition control-indicator—controls and indicators.

Key to fig. 82	Control or indicator	Type	Function
A	MAGNETRON meter		Indicates magnitude of average acquisition magnetron current, magnitude of high voltage applied to acquisition transmitter system, or magnitude of current of acquisition high-voltage power supply, as determined by the position of MAGNETRON switch (RR, fig. 82). Meter has two scales: the top scale is graduated from 0 to 50 in increments of 2.5; the lower scale is graduated from 0 to 100 in increments of 5.
B	NOISE GEN-ON indicator light	Green	When illuminated, indicates that the noise generator test circuit is energized.
C	NOISE GEN switch	Rotary (three-position).	When set to OFF position, causes the MAG FREQ & REC NOISE meter (G, fig. 82) to indicate the relative acquisition magnetron frequency and deenergizes the noise generator test circuits. When set to ADJ position, establishes a noise reference level on the MAG FREQ & REC NOISE meter (G, fig. 82) for use when checking and adjusting receiver noise of the acquisition receiver system, and illuminates NOISE GEN-ON indicator light (B, fig. 82). When set to MEAS position, causes MAG FREQ & REC NOISE meter (G, fig. 82) to present an indication which may be used to calculate acquisition receiver noise level, provided a reference level was previously established.
D	AFC-HUNT indicator light	Red	When illuminated to a steady glow, indicates that the acquisition automatic frequency control (AFC) circuit is searching for the correct intermediate frequency (IF). When illuminated to a flickering glow, or extinguished, and strong video appears on the PPI (fig. 24) on the battery control console, indicates that the acquisition AFC circuit is locked on the correct intermediate frequency (IF). When illuminated to a flickering glow, and reduced or no video appears on the PPI (fig. 24), indicates that the acquisition automatic frequency control (AFC) circuit is locked on the incorrect intermediate frequency (IF).
E	AFC switch	Toggle (two-position).	When turned to the on (up) position, energizes the acquisition automatic frequency control (AFC) circuits.
F	Frequency switch	Toggle (three-position, spring-loaded to center position).	When operated to the DECREASE FREQ position, decreases the frequency of the acquisition magnetron to a minimum of 3100 megacycles. When operated to the INCREASE FREQ position, increases the frequency of the acquisition magnetron to a maximum of 3500 megacycles. When released from either the INCREASE FREQ or DECREASE FREQ position, causes the acquisition magnetron to operate at the frequency indicated on the MAG FREQ & REC NOISE meter (G, fig. 82).

Key to fig. 82	Control or indicator	Type	Function
G	MAG FREQ & REC NOISE meter.	....	Indicates the relative acquisition magnetron frequency when NOISE GEN switch (C, fig. 82) is set to OFF position. Indicates a noise reference level for use in determining acquisition receiver noise level when NOISE GEN switch (C, fig. 82) is set to ADJ position. Provides an indication which may be used to calculate acquisition receiver noise level when NOISE GEN switch (C, fig. 82) is set to MEAS position. Meter is graduated from 0 to 100 in increments of 5.
H	AFC-RELEASE switch......	Pushbutton .	When held depressed for 5 seconds, then released, allows acquisition automatic frequency control (AFC) circuits to begin the search cycle for the correct intermediate frequency (IF) as indicated by illumination of the AFC-HUNT indicator light (D, fig. 82).
J	VID ALARM THRESHOLD knob and switch.	Rotary	When rotated clockwise from the OFF position toward the ADJ position, establishes a minimum signal strength which a target return signal must equal or exceed in order to cause the loudspeaker (E, fig. 75) to sound. The video alarm circuits have been removed in systems incorporating the auxiliary acquisition radar (AAR), and the VID ALARM THRESHOLD knob and switch have no functional purpose.
J.1	INT SPR switch.............	Toggle (two-position). ..	When operated to INT SPR position, adds interference suppression circuits to acquisition receiver in order to reduce interfering signals and noise.
K	IFF-GAIN knob..............	Rotary	When turned, adjusts the gain of interrogator set AN/TPX-27 to obtain optimum IFF presentation displaying on the PPI (fig. 24) on the battery control console.
L	IFF-ON indicator light.......	Ivory	When illuminated, indicates that interrogator set AN/TPX-27 is energized.
M	ANTENNA-AZIMUTH RPM switch.	Rotary (four-position) ..	When set to OFF position, causes the acquisition antenna (fig. 39) not to rotate. When set to 5, 10, or 15 position, causes the acquisition antenna to rotate at 5, 10, or 15 rpm respectively, provided the antenna disable switch (A, fig. 108) on the acquisition antenna-receiver-transmitter group (fig. 39) is set to the ON position and ACQ MOTORS switch (A, fig. 71) is set to ON position.
N	ANTENNA-ELEVATION indicator.	Dial	Indicates the relative elevation of the acquisition radar transmitter beam. Indicator is graduated from 0 to 400 mils in increments of 50 mils.

Key to fig. 82	Control or indicator	Type	Function
P	ANTENNA-ELEVATION scan switch.	Toggle (three-position, spring-loaded to center position in UP position only).	When operated to and held in the UP position, increases the elevation of the acquisition antenna transmitted beam to a maximum of 400 mils. When set to the DOWN/SCAN position, decreases the elevation of the acquisition antenna transmitted beam to a minimum of 0 mils. If allowed to remain in the DOWN/SCAN position, the acquisition antenna transmitted beam automatically scans between 0 mils and the upper limit of the prevailing scan condition. When released from the UP position, or when set to the center position from the DOWN/SCAN position, causes the elevation of the acquisition antenna transmitted beam to remain at the elevation angle indicated on the ANTENNA-ELEVATION indicator (N, fig. 82).

Key to fig. 82	Control or indicator	Type	Function
Q	IFF-CHALLENGE indicator light.	Green	When illuminated, indicates the transmitter output is a pulse pair at normal power level. When extinguished, indicates the transmitter output is below normal power level.
R	IFF-CHALLENGE switch	Pushbutton	When depressed, causes interrogator set AN/TPX-27 to interrogate target.
S	IFF-GTC switch	Toggle (two-position).	When set to the SHORT position, automatically conditions the receiver circuits of interrogator set AN/TPX-27 circuits so that IFF return signals from targets at relatively close ranges are displayed in proper size on the PPI (fig. 24) of the battery control console. When set to the LONG position, automatically conditions the receiver circuits of interrogator set AN/TPX-27 so that IFF return signals from targets at relatively long ranges are displayed in proper size on the PPI (fig. 24) of the battery control console.
T	IFF-MODE switch	Toggle (three-position).	When set to position 1, 2, or 3: *a.* Conditions the video decoder for either mode 1, mode 2, or mode 3 operation. *b.* Allows for selection of particular code in mode 1, mode 2, or mode 3 operation.
U	IFF-FOE switch	Pushbutton	When depressed, illuminates green TARGET-FOE indicator light (P of 1, fig. 77) and extinguishes ivory TARGET-FOE indicator light (H of 2, fig. 77) on the battery control console, indicating that the challenged target is hostile.
V	MODE 1 CODE switch (outer knob).	Rotary (eight-position).	When set to any number between zero (0) and eight (8), selects the second significant number of the code for MODE 1 operation.
W	MODE 1 CODE switch (inner knob).	Rotary (five-position).	When set to any number between zero (0) and three (3), selects the first significant number of the code for MODE 1 operation. When set to REM position, transfers control of code settings from the master remote switching control to a remote point where an auxiliary remote switching control may be utilized.
X	MODE 2 CODE switch (outer knob.)	Rotary (eight-position).	When set to any number between zero (0) and eight (8), selects the second significant number of the code for MODE 2 operation.
Y	MODE 2 CODE switch (inner knob).	Rotary (eight-position).	When set to any number between zero (0) and eight (8), selects the first significant number of the code for MODE 2 operation.
Z	MODE 3 CODE switch (outer knob).	Rotary (eight-position).	When set to any number between zero (0) and eight (8), selects the second significant number of the code for MODE 3 operation.
AA	MODE 3 CODE switch (inner knob).	Rotary (eight-position).	When set to any number between zero (0) and eight (8), selects the first significant number of the code for MODE 3 operation.

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Key to fig. 82	Control or indicator	Type	Function
BB	OPERATE-TEST switch	Toggle (two-position).	When set to OPERATE position, the coded pulses are sent to the video decoder to determine the identity of the challenged target. When set to TEST position, the coded pulses are sent directly to the presentation system for display on the PPI.
CC	IFF-FRIEND switch	Toggle (two-position, spring-loaded to down position, with guard).	When operated to the on (up) position, causes the missile tracking radar system to stop tracking the missile in flight and return to the next designated missile or flight simulator group and also causes the engagement sequence (foe to burst) for the immediate target to stop. This also causes the green TARGET-FOE indicator light (P of 1, fig. 77) on the battery signal panel-indicator (fig. 24) to extinguish, and the ivory TARGET-FOE indicator light (H2, fig. 77) to illuminate.
DD	IFF-CHOP switch	Toggle (two-position).	When turned to the on (up) position: *a.* Produces broken traces of the IFF return signals as displayed on the PPI (fig. 24) on the battery control console. *b.* Permits B+ power to be applied to the simulator provided the B+ ON—LOCAL-REMOTE switch (F, fig. 109) is set to REMOTE.
EE	MTI-MODE switch	Rotary (three-position).	When set to OFF position, deenergizes the moving target indicator circuit of the acquisition radar system. When set to 360° position, causes moving target indicator (MTI) control to be in effect over the entire PPI presentation. When set to SECTOR position, causes moving target indicator (MTI) control to act upon only that portion of the PPI as selected by the MTI-SECTOR ANGLE knob (FF, fig. 82).
FF	MTI-SECTOR ANGLE knob	Rotary (with lock).	When turned, positions the moving target indicator (MTI) sector on the PPI to any azimuth throughout 360 degrees.
GG	RECEIVER-GAIN knob	Rotary	When turned, adjusts the intensity of the video display on the PPI (fig. 24) and the precision indicator on the battery control console.
HH	RECEIVER-STC knob	Rotary	When turned, adjusts the intensity of the video displayed on the PPI (fig. 24) on the battery control console, from origin of rotating radial sweep (C, fig. 113) to 20,000 $\pm$5,000 yards in range to minimize effects of ground clutter and blossoming.
JJ	IND HV switch	Toggle (two-position).	When turned to the on (up) position, applies high voltage to the PPI (fig. 24) and the precision indicator on the battery control console. Illuminates IND HV-ON indicator light (KK, fig. 82).

Key to fig. 82	Control or indicator	Type	Function
KK	IND HV-ON indicator light	White	When illuminated, indicates that high voltage is being applied to the PPI (fig. 24) and the precision indicator on the battery control console.
LL	MAGNETRON-ON switch	Pushbutton	When depressed, applies high voltage to the acquisition transmitter system. Illuminates MAGNETRON-ON indicator light (MM, fig. 82), and HIGH VOLTS—ON indicator (Y, fig. 70) on the acquisition power control panel (fig. 19) and extinguishes MAGNETRON-READY indicator light (PP, fig. 82). Extinguishes the following indicator lights on the acquisition power control panel: *a.* HIGH-VOLTS—READY indicator light (Z, fig. 70). *b.* HIGH VOLTS—HOT indicator light (AA, fig. 70). *c.* HIGH VOLTS—PREHEAT indicator light (BB, fig. 70). *d.* INTLK indicator light (LL, fig. 70).
MM	MAGNETRON-ON indicator light.	Red	When illuminated, indicates that high voltage is being applied to the acquisition transmitter system.
NN	MAGNETRON-OFF switch	Pushbutton	When depressed, removes high voltage from the acquisition transmitter system. Extinguishes MAGNETRON-ON indicator light (MM, fig. 82) and HIGH VOLTS—ON indicator light (Y, fig. 70) on the acquisition power control panel (fig. 19). Illuminates MAGNETRON-READY indicator light (PP, fig. 82), and illuminates the following indicator lights on the acquisition power control panel: *a.* HIGH VOLTS—READY indicator light (Z, fig. 70). *b.* HIGH VOLTS—HOT indicator light (AA, fig. 70). *c.* HIGH VOLTS—PREHEAT indicator light (BB, fig. 70). *d.* INTLK indicator light (LL, fig. 70).
PP	MAGNETRON-READY indicator light.	Green	When illuminated, indicates that high voltage may be applied to the acquisition transmitter system.
QQ	MAGNETRON HV supply knob.	Rotary	When turned, adjusts high voltage applied to the acquisition transmitter system, as indicated on the MAGNETRON meter (A, fig. 82). (Must be in START position, fully counterclockwise, before high voltage can be applied to the acquisition system).

Key to fig. 82	Control or indicator	Type	Function
RR	MAGNETRON switch	Toggle (three-position spring-loaded to center position).	When operated to KV FS=10 position: MAGNETRON meter (A, fig. 82) indicates magnitude of high voltage being applied to the magnetron of the acquisition transmitter system. Magnitude is indicated on lower scale of meter. Scale is graduated from 0 to 100, representing 0 to 10,000 volts, in increments of 5, representing 500 volts. When in FS 50MA position: MAGNETRON meter (A, fig. 82) indicates average current of the magnetron of the acquisition transmitter system. Current is indicated in milliamperes on the top scale of the meter. Scale is graduated from 0 to 50, in increments of 2.5 milliamperes. When operated to MA FS=1,000 position: MAGNETRON meter (A, fig. 82) indicates average current of the acquisition magnetron high voltage power supply. Current is indicated in milliamperes on the lower scale of the meter. Scale is graduated from 0 to 100, representing 0 to 1,000 milliamperes, in increments of 5, representing 50 milliamperes.

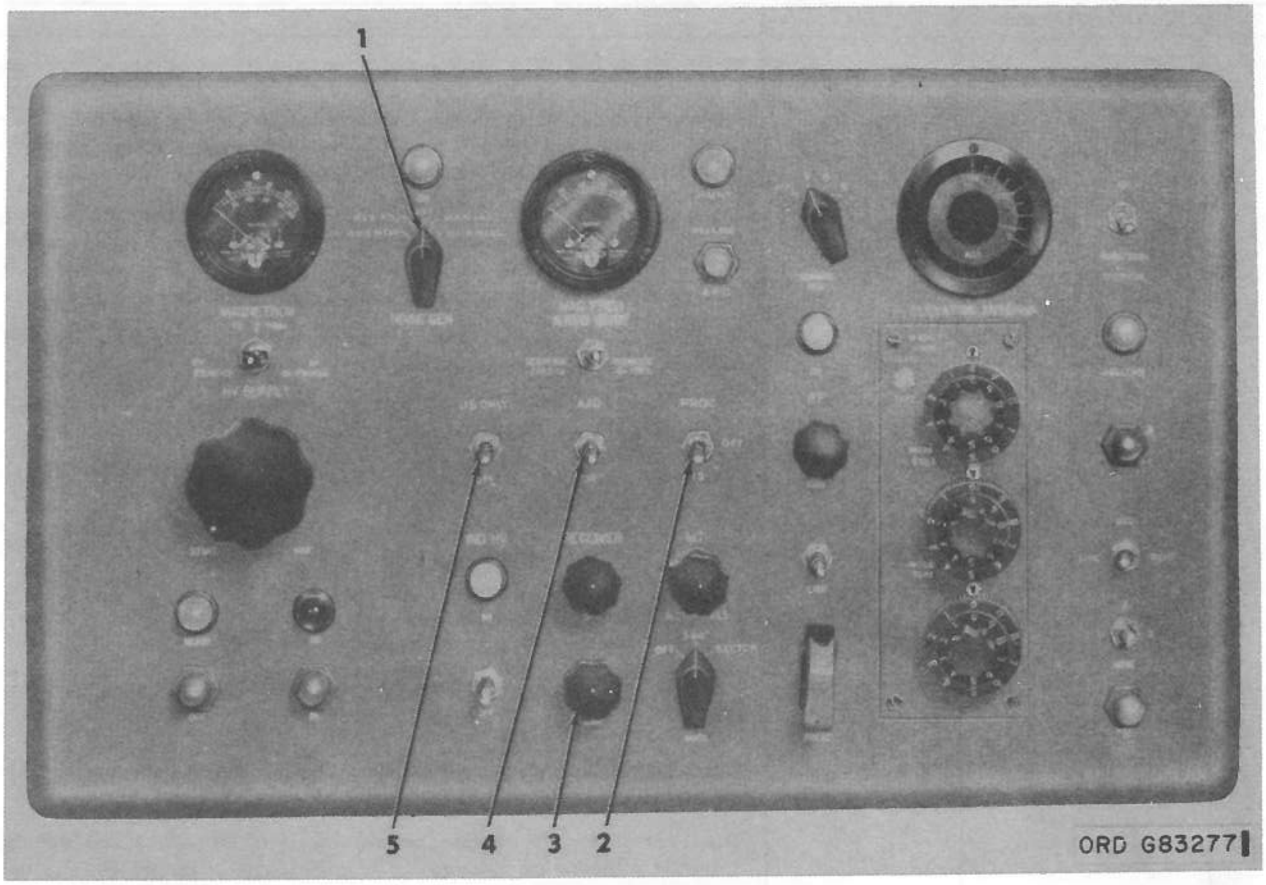


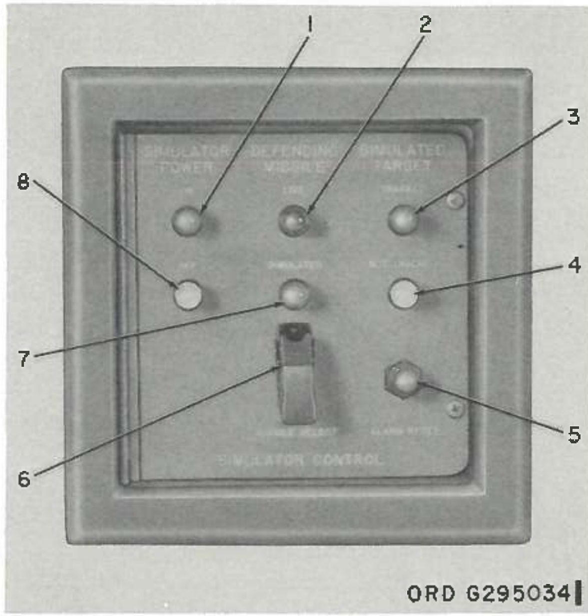
Figure 82.1 (CMHA). Acquisition control-indicator.

Key	Control or Indicator	Type	Function
1	NOISE GEN switch	Rotary (five-position)	When set to the OFF position, causes the MAG FREQ & REC NOISE meter (G, fig. 82) to indicate the relative acquisition magnetron frequency and deenergizes the noise generator test circuits. When set to the MAIN ADJ position, enables the noise test circuits in the main acquisition receiver and causes the MAGNETRON meter (A, fig. 82) to indicate the noise reference level of the main acquisition receiver channel. Also illuminates NOISE GEN—ON indicator light (B, fig. 82). When set to the MAIN MEAS position, enables noise test circuit and causes the MAGNETRON meter (A, fig. 82) to provide an indication that is used in conjunction with the noise reference level to calculate noise in the main acquisition receiver channel.

Figure 82.1 (CMHA). Acquisition control-indicator — legend.

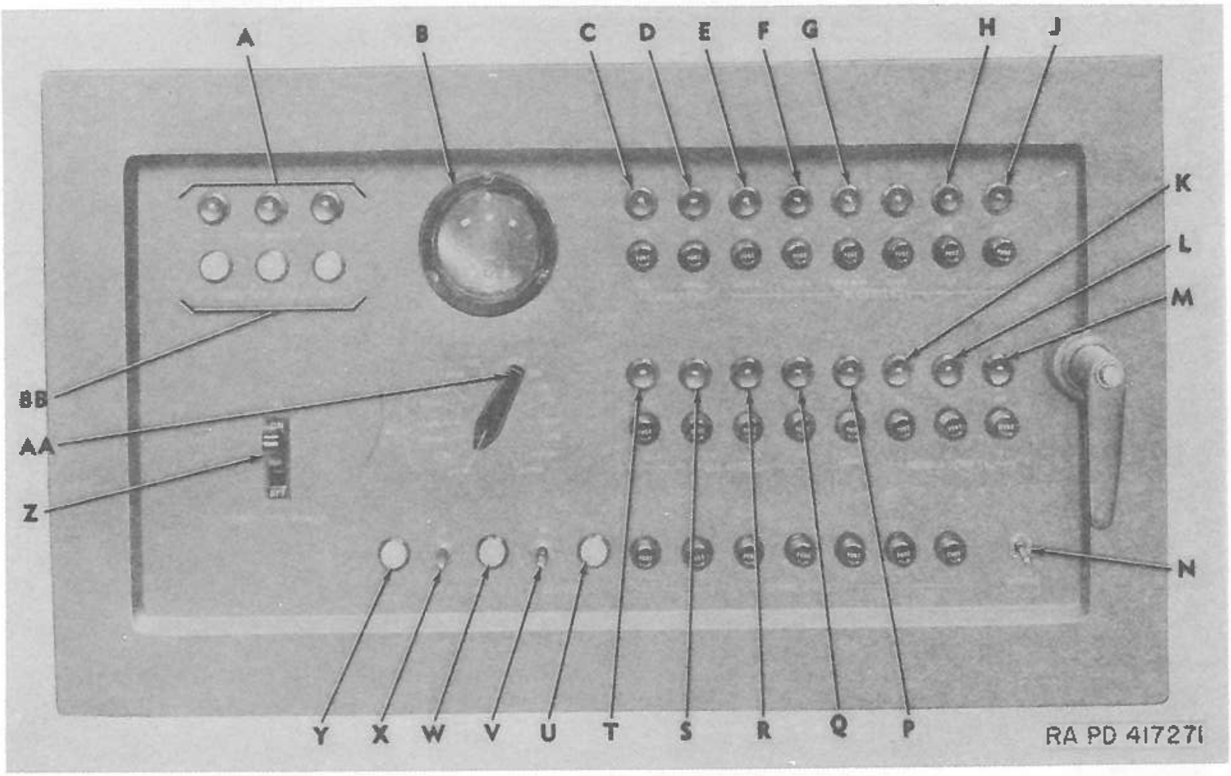
Key	Control or Indicator	Type	Function
			When set to the AUX ADJ position, enables the noise test circuits in the auxiliary acquisition receiver and causes the MAGNETRON meter (A, fig. 82) to indicate the noise reference level of the auxiliary acquisition receiver channel. Also illuminates the NOISE GEN —ON indicator light (B, fig. 82).
			When set to the AUX MEAS position, enables noise test circuit and causes the MAGNETRON meter (A, fig. 82) to provide an indication that is used in conjunction with the noise reference level to calculate noise in the auxiliary acquisition receiver channel.
2	PROC switch	Toggle (three position)	When set to IS position, interference suppressor (IS) video is applied to the presentation system.
			When set to the OFF position, normal video or MTI video is applied to the presentation system.
			When set to the on (up) position, MTI video is squelched and normal video is applied to the presentation system.
3	RECEIVER-GAIN	Rotary with switch	When turned, adjusts the signal gain of the video displayed on the PPI (fig. 24) and precision indicator.
			When turned to the extreme clockwise position, the main and auxiliary receivers operate at maximum gain.
4	AJD	Toggle	When set to the OFF position, disables the auxiliary receiving channel.
			When set to the on (up) position, enables the AJD video circuits.
5	JS ONLY switch	Toggle	When set to the on (up) position, permits jamming strobe video only to be displayed on the presentation system.
			When set to the OFF position, permits display of all other video signals on the presentation system.

Figure 82.1 (CMHA). Acquisition control-indicator legend—continued.



Key	Control or indicator	Type	Function
1	SIMULATOR POWER-ON indicator light	Red	Illuminates when power from the T1 trainer is applied to the simulator control panel.
2	DEFENDING MISSILE-LIVE indicator light	Green	When illuminated, indicates the MISSILE SELECT switch is set to the live missile (up) position.
3	SIMULATED TARGET-TRACKED indicator light	Green	Illuminates when a simulated target is being tracked.
4	SIMULATED TARGET-NOT TRACKED indicator light	White	Illuminates when the TTR loses the simulated target being tracked.
5	ALARM RESET switch	Pushbutton	When depressed, silences the off target buzzer.
6	MISSILE SELECT switch	Toggle (two position)	When set to the simulated missile (down) position, disables the MTR antenna positioning circuits and the fire circuit. When this occurs, the DEFENDING MISSILE-SIMULATED indicator light illuminates and the sum video IF is applied to the radar set group from the T1 trainer. When set to the live missile (up) position, the sum video IF input from the T1 trainer is removed and the no-loss indication applied to the T1 trainer is removed. When this occurs, the DEFENDING MISSILE-LIVE indicator light illuminates and the DEFENDING MISSILE-SIMULATED indicator light extinguishes.
7	DEFENDING MISSILE-SIMULATED indicator light	Green	When illuminated, indicates the MISSILE SELECT switch is set to the simulated missile (down) position.
8	SIMULATOR POWER-OFF indicator light	White	Illuminates when power from the T1 trainer to the simulator control panel is off.
	Off target buzzer	Buzzer	Provides audible alarm when the TTR loses the simulated target being tracked.

Figure 82.2 (U). Simulator control panel—controls and indicators (U).



Key	Control or indicator	Type	Function
A	Computer power FUSE INDICATOR lights (3)	Red	When any one is illuminated, indicates associated fuse located in the lower compartment of computer power supply group (fig. 27) is blown.
B	VOLTS CHECK meter		Indicates the output voltage amplitude of each of the computer power supplies as selected by the VOLTS CHECK switch (AA, fig. 83). Scale is graduated in quarter segments.
C	FILAMENTS-REG fuse indicator light	Red	When illuminated, indicates that the fuse directly beneath it has blown.
D	FILAMENTS-UNREG fuse indicator light	Red	When illuminated, indicates that the fuse directly beneath it has blown.
E	RECTIFIERS-320V A fuse indicator light	Red	When illuminated, indicates that the fuse directly beneath it has blown.
F	RECTIFIERS-320V B fuse indicator light	Red	When illuminated, indicates that the fuse directly beneath it has blown.
G	RECTIFIER-320V BIAS fuse indicator light	Red	When illuminated, indicates that the fuse directly beneath it has blown.

Figure 83 (U). Computer power control panel—controls and indicators.

Key to fig. 83	Control or indicator	Type	Function
H	RECTIFIERS-270V fuse indicator lights (2).	Red	When either one is illuminated, indicates that the fuse directly beneath it has blown.
J	RECTIFIERS-FIL fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
K	MOTOR & SERVO EXC.-A fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
L	MOTOR & SERVO EXC.-B fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
M	MOTOR & SERVO EXC.-C fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
N	INTLK OVERRIDE switch	Toggle (two-position, spring-loaded to down position).	When operated to the on (up) position, electrically bypasses all interlock switches associated with the servo computer assembly (B, fig. 16), computer amplifier-relay group, and the computer power supply group.
P	PLOT LIGHTS fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
Q	REGULATORS −250V fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
R	REGULATORS +250V fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
S	REGULATORS −200V B fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
T	REGULATORS −200V A fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
U	SERVO DC indicator light	White	When illuminated, indicates that dc power is being applied to the servos of the computer system.
V	SERVO DC switch	Toggle (two-position).	When set to the ON position, applies dc power to the servos of the computer system. Illuminates the SERVO DC indicator light (U, fig. 83).
W	PLATE VOLTS indicator light	White	When illuminated, indicates that plate voltage is being applied to the computer system.
X	PLATE VOLTS switch	Toggle (two-position).	When set to the ON position, applies plate voltage to the computer system. Illuminates PLATE VOLTS indicator light (W, fig. 83), and extinguishes INTLK READY indicator light (Y, fig. 83).
Y	INTLK READY indicator light	Ivory	When illuminated, indicates that plate voltage may be applied to the computer system.
Z	COMPUTER POWER switch	Toggle (two position, heavy duty).	When set to the ON position, makes ac power available to the computer system.
AA	VOLTS CHECK switch	Rotary (16-position).	When set, switches the output voltages of the power supplies of the computer system as indicated by switch setting, to VOLTS CHECK meter (B, fig. 83), for checking purposes.
BB	COMPUTER POWER ON indicator lights (3).	White	When illuminated, indicates that each phase of the 3-phase power is available to the computer system.

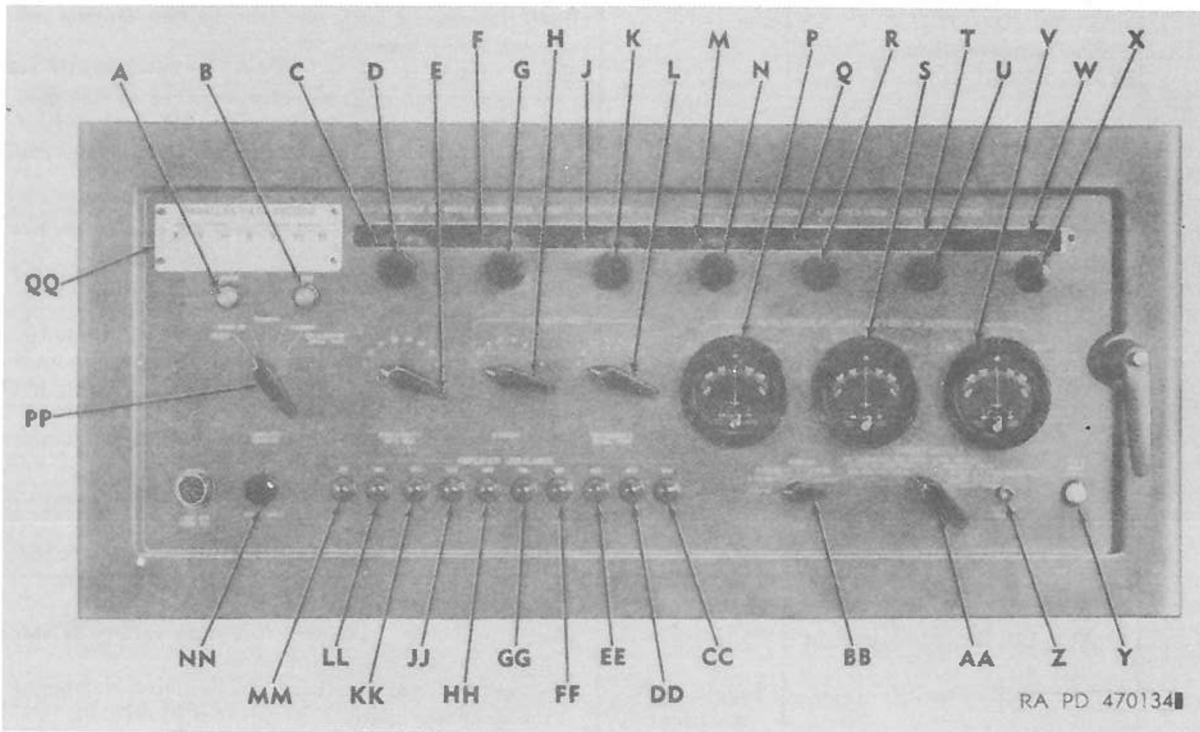


Figure 84. Computer control panel - controls and indicators.

Key	Control or indicator	Type	Function
A	ACTION indicator light	Green	When illuminated, indicates that the computer system is in the action condition.
B	TEST indicator light	Red	When illuminated, indicates that the computer system is in either the test condition or the standby condition.
C	LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS-X dial		Indicates the X (east-west) parallax distance in yards from the target track antenna-receiver-transmitter group to the missile track antenna-receiver-transmitter group. The dial is graduated from 166 E (east) to 166 W (west) in increments of 2 yards.
D	LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS-X knob	Rotary (with lock)	When turned, electrically compensates for the X (east-west) parallax distance of the missile track antenna-receiver-transmitter group from the target track antenna-receiver-transmitter group as indicated on the LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS-X dial (C, fig. 84).
E	GYRO AZIMUTH 100'S MILS switch	Rotary (eight-position)	When set to any one of its eight positions, causes the GYRO AZIMUTH dial (D, fig. 85) to indicate a gyro azimuth (A_G) value corresponding to the switch setting multiplied by 100, provided the COMPUTER CONDITION switch (PP, fig. 84) is set to STEERING or STANDBY.
F	LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS-Y dial		Indicates the Y (north-south) parallax distance in yards from the target track antenna-receiver-transmitter group to the missile track antenna-receiver-transmitter group. The dial is graduated from 166 N (north) to 166 S (south) in increments of 2 yards.
G	LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS-Y knob	Rotary (with lock)	When turned, electrically compensates for the Y (north-south) parallax distance of the missile track antenna-receiver-transmitter group from the target track antenna-receiver-transmitter group as indicated on the LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS-Y dial (F, fig. 84).
H	STATIC TEST-STEERING switch	Rotary (eight-position)	When set to any one of its eight positions, selects the static test problem, corresponding to the switch setting, to be introduced into the steering circuits of the computer system, provided COMPUTER CONDITION switch (PP, fig. 84) is set to the STEERING position.
J	LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS-H dial		Indicates the H (up-down) parallax distance in yards from the target track antenna-receiver-transmitter group to the missile track antenna-receiver-transmitter group. The dial is graduated from 166 UP to 166 DN in increments of 2 yards.
K	LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS-H knob	Rotary (with lock)	When turned, electrically compensates for the H (up-down) parallax distance of the missile track antenna-receiver-transmitter group from the target track antenna-receiver-transmitter group as indicated on the LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS-H dial (J, fig. 84).

Figure 84 (CMHA). Computer control panel—controls and indicators—legend.

Key	Control or indicator	Type	Function
L	STATIC TEST-PRELAUNCH & INITIAL TURN switch	Rotary (eight-position)	When set to any one of its eight positions, selects the static test problem, corresponding to the switch setting, to be introduced into the prelaunch and initial turn circuits of the computer system provided COMPUTER CONDITION switch (PP, fig. 84) is set to PRELAUNCH & INITIAL TURN position.
M	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-X dial		Indicates the X (east-west) parallax distance in yards to the center of the launching area from the target track antenna-receiver-transmitter group. The dial is graduated from 6000 E (east) to 6000 W (west) in increments of 100 yards.
N	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-X knob	Rotary (with lock)	When turned, electrically compensates for the X (east-west) parallax distance to the center of the launching area from the target track antenna-receiver-transmitter group, as indicated on the LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-X dial (M, fig. 84).
P	ACCELERATION, VELOCITY AND POSITION DIFFERENCE-X G_Y meter		Indicates the X (east-west) coordinate of target velocity, target acceleration, missile velocity, position difference from missile to target, or G_Y (yaw) steering order, as determined by the setting of the TARGET MISSILE switch (AA, fig. 84).
Q	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-Y dial		Indicates the Y (north-south) parallax distance in yards from the center of the launching area to the target track antenna-receiver-transmitter group. The dial is graduated from 6000 S (south) to 6000 (north) in increments of 100 yards.
R	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-Y knob	Rotary (with lock)	When turned, electrically compensates for the Y (north-south) parallax distance to the center of the launching area from the target track antenna-receiver-transmitter group, as indicated on the LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-Y dial (Q, fig. 84).
S	ACCELERATION, VELOCITY AND POSITION DIFFERENCE-Y, G_P meter		Indicates the Y (north-south) coordinate of target velocity, target acceleration, missile velocity, position difference from missile to target, or G_P (pitch) steering order, as determined by the setting of TARGET MISSILE switch (AA, fig. 84).
T	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-H dial		Indicates the H (up-down) parallax distance in yards to the center of the launching area from the target track antenna-receiver-transmitter group. The dial is graduated from 6000 DN to 6000 UP in increments of 100 yards.
U	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-H knob	Rotary (with lock)	When turned, electrically compensates for the H (up-down) parallax distance to the center of the launching area from the target track antenna-receiver-transmitter group as indicated on the LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-H dial (T, fig. 84).

Figure 84 (CMHA). Computer control panel—controls and indicators—legend—continued.

Key	Control or indicator	Type	Function
V	ACCELERATION, VELOCITY AND POSITION DIFFERENCE-H, G_T meter		Indicates the H (up-down) coordinate of target velocity, target acceleration, missile velocity, position difference from missile to target, or G_T (computed turn acceleration) as determined by the setting of TARGET MISSILE switch (AA, fig. 84).
W	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-R dial		Indicates the R (range) parallax distance to the center of the launching area from the target track antenna-receiver-transmitter group. The dial is non-linearly graduated from 1000 to 6000 yards.
X	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-R knob	Rotary (11-position)	When turned, electrically compensates for the R (range) parallax distance to the center of the launching area from the target track antenna-receiver-transmitter group as indicated on the LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-R dial (W, fig. 84).
Y	TT/VC SERVO UNBAL indicator light	Red	When illuminated or flickering, indicates that transit time and/or velocity correction servos are slewing.
Z	POS DIFF YDS/10 switch	Pushbutton	When depressed, increases sensitivity of the ACCELERATION, VELOCITY AND POSITION DIFFERENCE meters (P, S, and V, fig. 84) by a factor of 10, provided the TARGET MISSILE switch (AA, fig. 84) is set to the POS DIFF FROM TARGET YDS position.
AA	TARGET MISSILE switch	Rotary(seven-position)	When set to any one of its seven positions, causes the ACCELERATION, VELOCITY AND POSITION DIFFERENCE meters (P, S, and V, fig. 84) to indicate information corresponding to the switch setting.
BB	TEST switch	Rotary (six-position)	When set to any one of the six positions, conditions the computer for a specific missile and mission.
CC	AMPLIFIER UNBALANCE GR10 indicator light	Amber	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 10, located in the computer amplifier-relay group (B, fig. 16).
DD	AMPLIFIER UNBALANCE GR9 indicator light	Amber	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 9, located in the computer amplifier-relay group (B, fig. 16).
EE	AMPLIFIER UNBALANCE GR8 indicator light	Amber	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 8, located in the computer amplifier-relay group (B, fig. 16).
FF	AMPLIFIER UNBALANCE GR7 indicator light	Amber	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 7, located in the computer amplifier-relay group (B, fig. 16).

Figure 84 (CMHA). Computer control panel—controls and indicators—legend—continued.

Key	Control or indicator	Type	Function
GG	AMPLIFIER UNBALANCE GR6 indicator light	Amber	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 6, located in the computer amplifier-relay group (B, fig. 16).
HH	AMPLIFIER UNBALANCE GR5 indicator light	Amber	When illuminated or flickering, indicates an unbalanced condition of one of the computing amplifiers in group 5, located in the computer amplifier-relay group (B, fig. 16).
JJ	AMPLIFIER UNBALANCE GR4 indicator light	Amber	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 4 in the computer amplifier-relay group (B, fig. 16).
KK	AMPLIFIER UNBALANCE GR3	Amber	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 3 in the computer amplifier-relay group (B, fig. 16).
LL	AMPLIFIER UNBALANCE GR2	Amber	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 2 in the computer amplifier-relay group (B, fig. 16).
MM	AMPLIFIER UNBALANCE GR1	Amber	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 1 in the computer amplifier-relay group (B, fig. 16).
NN	SERVO LIGHTS knob	Rotary	When turned, adjusts the intensity of the illuminating lights for the dials (J and K, fig. 86; A through E, fig. 85) of the servo computer assembly.
PP	COMPUTER CONDITION switch	Rotary (five-position)	When set to any one of the five positions, selects the mode of operation to be performed by the computer system, corresponding to the switch setting.
QQ	PARALLAX DATA RECORD plate		Provides means for manually recording for immediate reference the following data: X, Y, and H parallax to missile track antenna-receiver-transmitter group from the target track antenna-receiver-transmitter group; and X, Y, H, and R parallax to the center of the launching area from the target track antenna-receiver-transmitter group.

Figure 84 (CMHA). Computer control panel—controls and indicators—legend—continued.

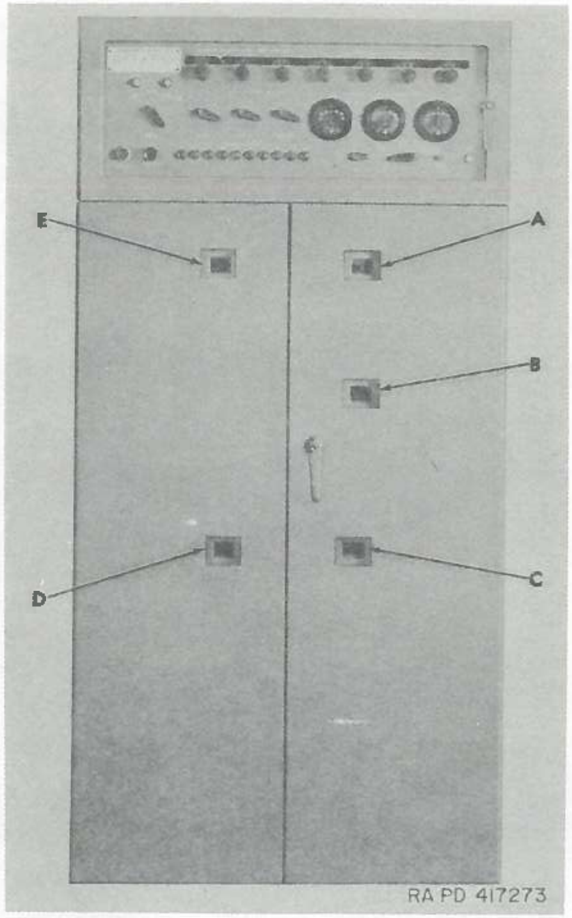


Figure 85 (U). Servo computer assembly—indicator dials viewed through lower compartment doors.

Key	Control or indicator	Type	Function
A	TURN ANGLE dial		Indicates the computed turn angle of the missile. Dial is graduated from −1600 to +1600 mils in increments of 5 mils.
B	TIME TO INTERCEPT dial		Indicates the length of time until intercept. Dial is graduated from 0 to 200 seconds in increments of 0.001 seconds.
C	BALLISTIC EL dial		Indicates the ballistic elevation angle of the predicted intercept point. Dial is graduated from −1600 to +1600 mils in increments of 5 mils.
D	GYRO AZIMUTH dial		Indicates the gyro azimuth (A_G) angle of the predicted intercept point from 0 to 6400 mils in increments of 5 mils.
E	CLIMB ANGLE dial		Indicates the computed climb angle of the missile. Dial is graduated from 0 to 6400 mils in increments of 5 mils.

Figure 85 (CMHA). Servo computer assembly—indicator dials viewed through lower compartment doors—legend.

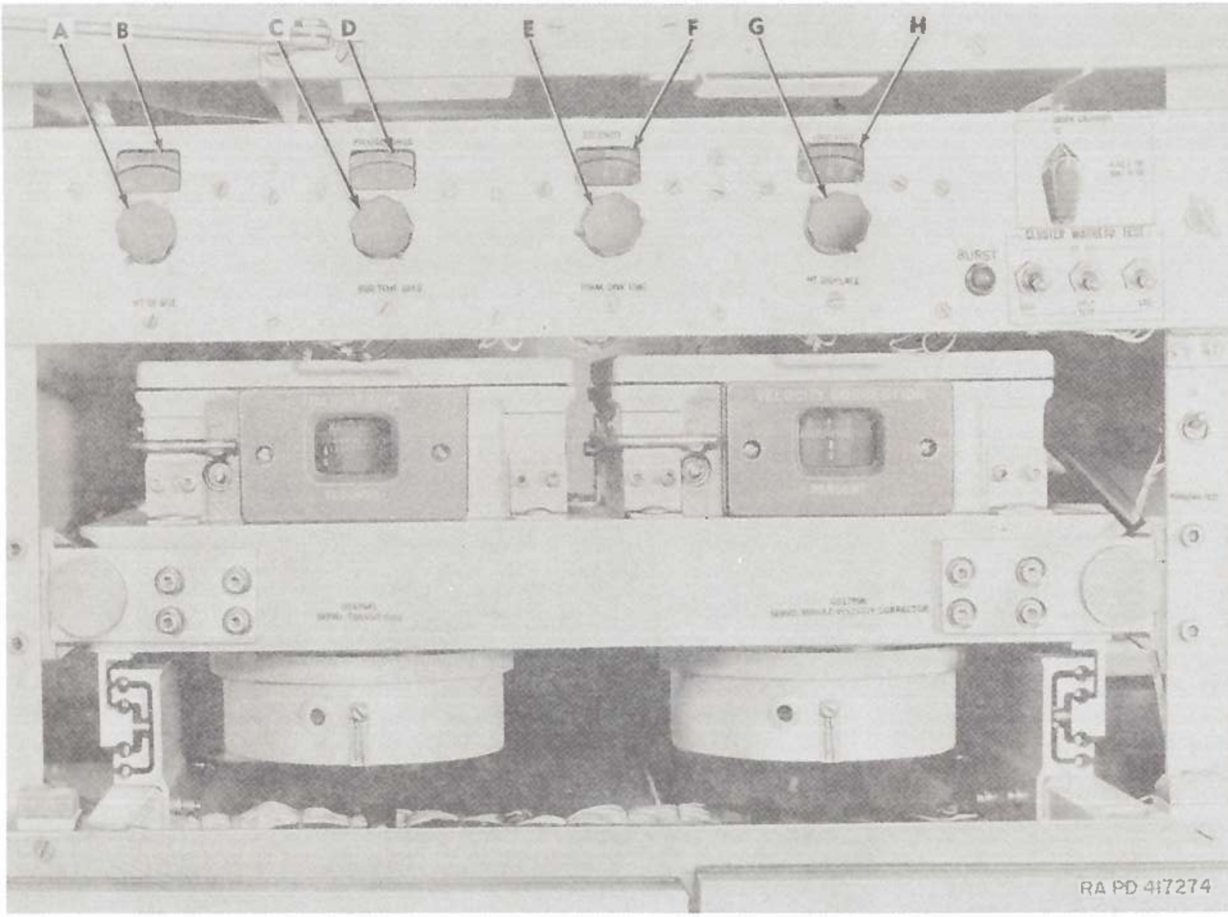


Figure 86 (CMHA). Servo computer assembly - upper compartment—behind panel—controls and indicators used by operator (systems 1031 and below).

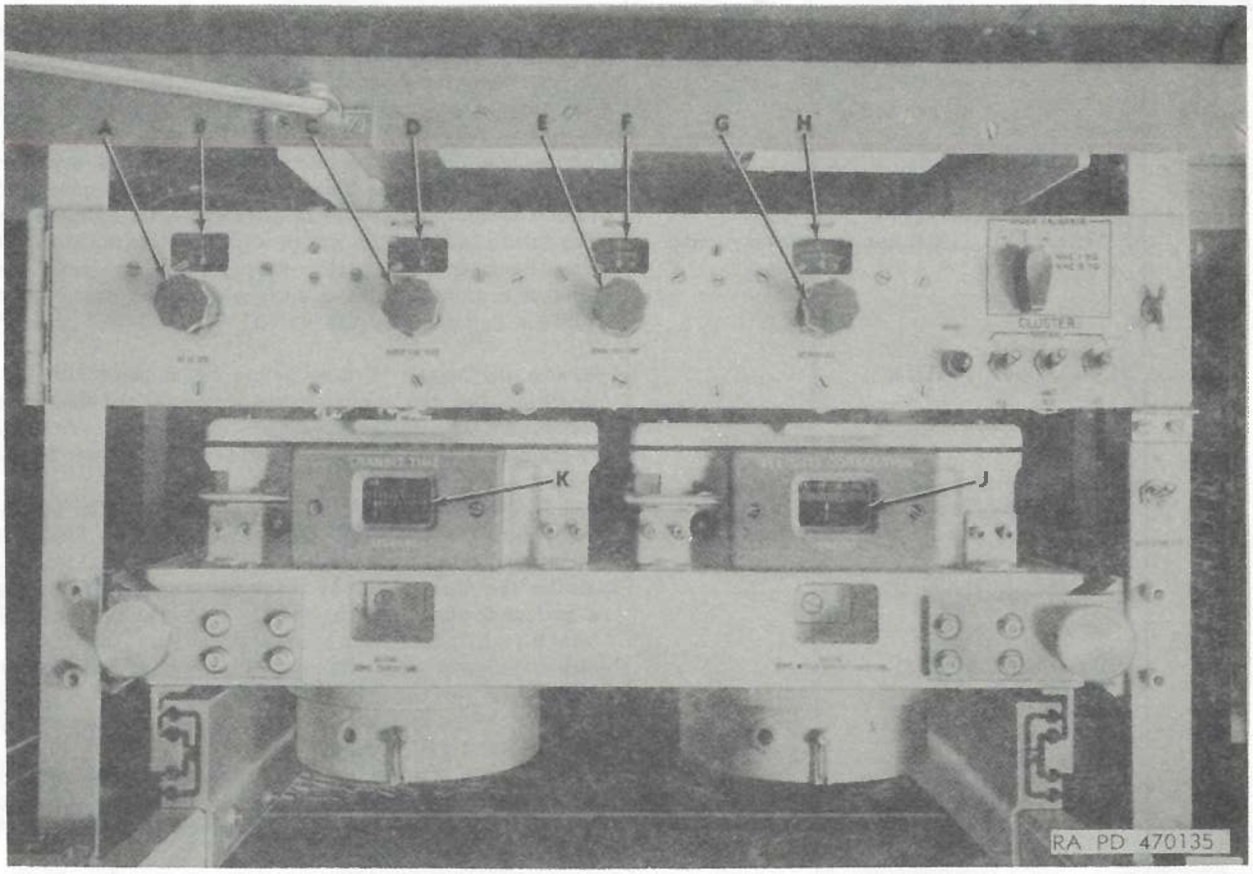


Figure 86.1 (CMHA). Servo computer assembly upper compartment—behind panel controls and indicators used by operator—systems 1032 and above.

Key to figs. 86 and 86.1	Control or indicator	Type	Function
A	HT OF SITE knob	Rotary (with lock).	When turned, electrically compensates for the altitude of the target track antenna-receiver-transmitter group above mean sea level. This altitude is indicated on the HT OF SITE dial (B, fig. 86).
B	HT OF SITE dial		Indicates the altitude of the target track antenna-receiver-transmitter group above mean sea level. Dial is graduated from 0 to 6000 feet in increments of 100 feet.

Figures 86 and 86.1 (CMHA). Servo computer assembly upper compartment—behind panel controls and indicators used by operator—legend.

Key to figs. 86 and 86.1	Control or indicator	Type	Function
C	BUR TIME BIAS knob	Rotary (with lock).	When turned, electrically compensates for delays inherent in the computer system, missile-tracking radar system, and the missile, in putting burst orders into effect. Time is indicated by the BUR TIME BIAS dial (D, fig. 86).
D	BUR TIME BIAS dial		Indicates the time before intercept at which the computer system must issue the burst order. The dial is graduated from 0 to 200 milliseconds in increments of 2 milliseconds.
E	FINAL DIVE TIME knob	Rotary (with lock).	When turned, adjusts the length of time before the apparent time-to-intercept that the computer system issues the final dive orders during a surface-to-surface engagement. Time is indicated by the FINAL DIVE TIME dial (F, fig. 86).
F	FINAL DIVE TIME dial		Indicates the length of time before the apparent time-to-intercept that the computer system issues the final dive orders during a surface-to-surface engagement. The dial is graduated from 0 to 25 seconds in increments of 0.2 second.
G	HT DISPLACE knob	Rotary (with lock).	When turned, adjusts the altitude of the displaced aiming point during a surface-to-surface engagement. This altitude is indicated by the HT DISPLACE dial (H, fig. 86).
H	HT DISPLACE dial		Indicates the altitude of the displaced aiming point during a surface-to-surface engagement. The dial is graduated from 0 to 100,000 feet in increments of 1000 feet.
J	VELOCITY CORRECTIONS dial.		Indicates automatically the velocity correction necessary to compensate for the loss of missile speed caused by motor burn out. The dial is graduated from 0 to 50 percent, in increments of 0.2 percent.
K	TRANSIT TIME dial		Indicates automatically the time it takes, after missile warhead detonation, for the warhead destructive force to reach a maximum. The dial is graduated from 0 to 16 seconds in increments of 0.01 second.

Figures 86 and 86.1 (CMHA). Servo computer assembly upper compartment—behind panel controls and indicators used by operator—legend—Continued.

Section II (CMHA). DESCRIPTION OF CONTROLS AND INDICATORS LOCATED IN THE TRAILER–MOUNTED TRACKING STATION

74 (U). Operating Controls and Indicators of Trailer Lighting Equipment, Cooling System, and Heating Equipment in the Trailer-Mounted Tracking Station

a. Operating Controls and Indicators of the Trailer Cooling System. Controls and indicators of the equipment cooling system for the trailer-mounted tracking station used by operating personnel are in the upper compartment (fig. 17) of the utility cabinet. These controls and indicators are shown on figure 69 (systems 1001–1382) or on figure 86.2 (systems 1383 and above) and described in the associated legend.

b. Operating Controls and Indicators of the Trailer Lighting Equipment. Controls and indicators of the trailer lighting equipment in the trailer-mounted tracking station used by operating personnel are on the trailer door light panel (fig. 87), electric light control on the target radar control console, trailer ceiling, the frame of the main entrance door, and the light fixture above the utility table. All of these controls and indicators are shown on figure 87 and described in the associated legend.

c. Operating Controls and Indicators of Trailer-Mounted Tracking Station Heating Equipment. The heating equipment in the trailer-mounted tracking station is identical to the heating equipment in the trailer-mounted director station, discussed in paragraph 68*c*. The controls and indicators of the trailer-mounted tracking station heating equipment are shown on figure 69.2 for systems 1086 and below, and on figure 69.3 for systems 1087 and above. Descriptions of the controls and indicators are presented in the legend associated with each figure.

75 (U). Operating Controls and Indicators of the Radar Power Supply Group

Operating controls and indicators of the radar power supply group (A, fig. 31) used by operating personnel are on the front of the radar power control panel, behind the radar power control panel, and on the missile and target fuse panel. These assemblies are discussed in *a* through *c* below, respectively.

a. Front Panel—Radar Power Control Panel.

(1) *Controls and indicators.* The front panel controls and indicators, except fuse indicator lights, of the radar power control panel (fig. 33) are shown on figure 88 and described in the associated legend.

(2) *Fuse indicator lights.* The fuse indicator lights on the front panel of the radar power control panel (fig. 33) are shown on figure 89 and described in the associated legend.

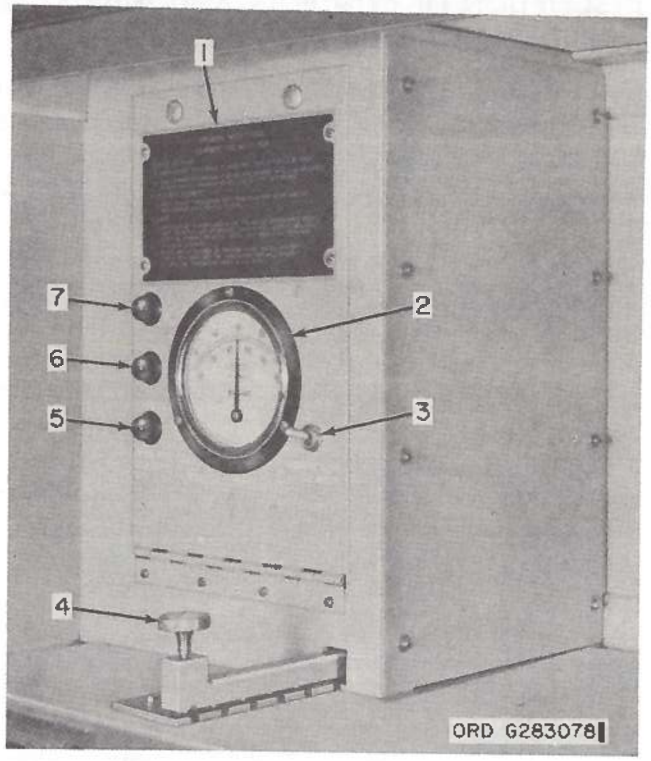
b. Behind Panel—Radar Power Control Panel. The behind panel control on the radar power control panel (fig. 33) used by operating personnel is shown on figure 90 and described in the associated legend.

c. Missile and Target Fuse Panel. Fuse indicator lights of the missile and target fuse panel (fig. 33) are shown on figure 91 and described in the associated legend.

76 (U). Operating Controls and Indicators of the Target Radar Control Console

Controls and indicators of the target radar control console (A, fig. 31), used by operating personnel, are on the target track indicator assembly (fig. 34), azimuth and elevation deviation indicator, precision indicator, target test control, target track control drawer, electric light control, elevation indicator, azimuth indicator, range indicator, target track control power supply, PPI, and upper center compartment door. The controls and indicators of each of the above assemblies are described in *a* through *j* below.

a. Target Track Indicator Assembly. The indicator lights of the target track indicator assembly are shown on figure 92 and described in the associated legend.



Key	Control or indicator	Type	Function
1	OPERATING INSTRUCTIONS plate.		Provides instructions for operation of equipment cooling system, covering damper settings, filter replacements, and alarms.
2	EXHAUST TEMPERATURE meter.		Indicates temperature of exhaust air from −20° to +180° F in increments of 5°.
3	Buzzer switch	Toggle (two position, spring-loaded to up)	When operated to the off (down) position, silences the overheat alarm buzzer.
4	Damper and shutter lever	Five-position	Controls air intake and exhaust of the equipment cooling system. Lever may be operated from the CLOSED (pushed in) position to the OPEN (pulled out) position in increments of one-quarter inch.
5	System overheat indicator light	Red	When illuminated, indicates the temperature of the system cooling air has reached 140° F. Extinguishes when temperature drops below 130° F.
6	TTC OVERHEATED indicator light.	Red	When illuminated, indicates the temperature of target radar control console cooling air has reached 140° F. Extinguishes when temperature drops below 130° F.
7	RSG OVERHEATED indicator light.	Red	When illuminated, indicates the temperature of radar set group cooling air has reached 140° F. Extinguishes when temperature drops below 130° F.

Figure 86.2 (U). Equipment cooling system (trailer-mounted tracking station—systems 1383 and above) controls and indicators (U).

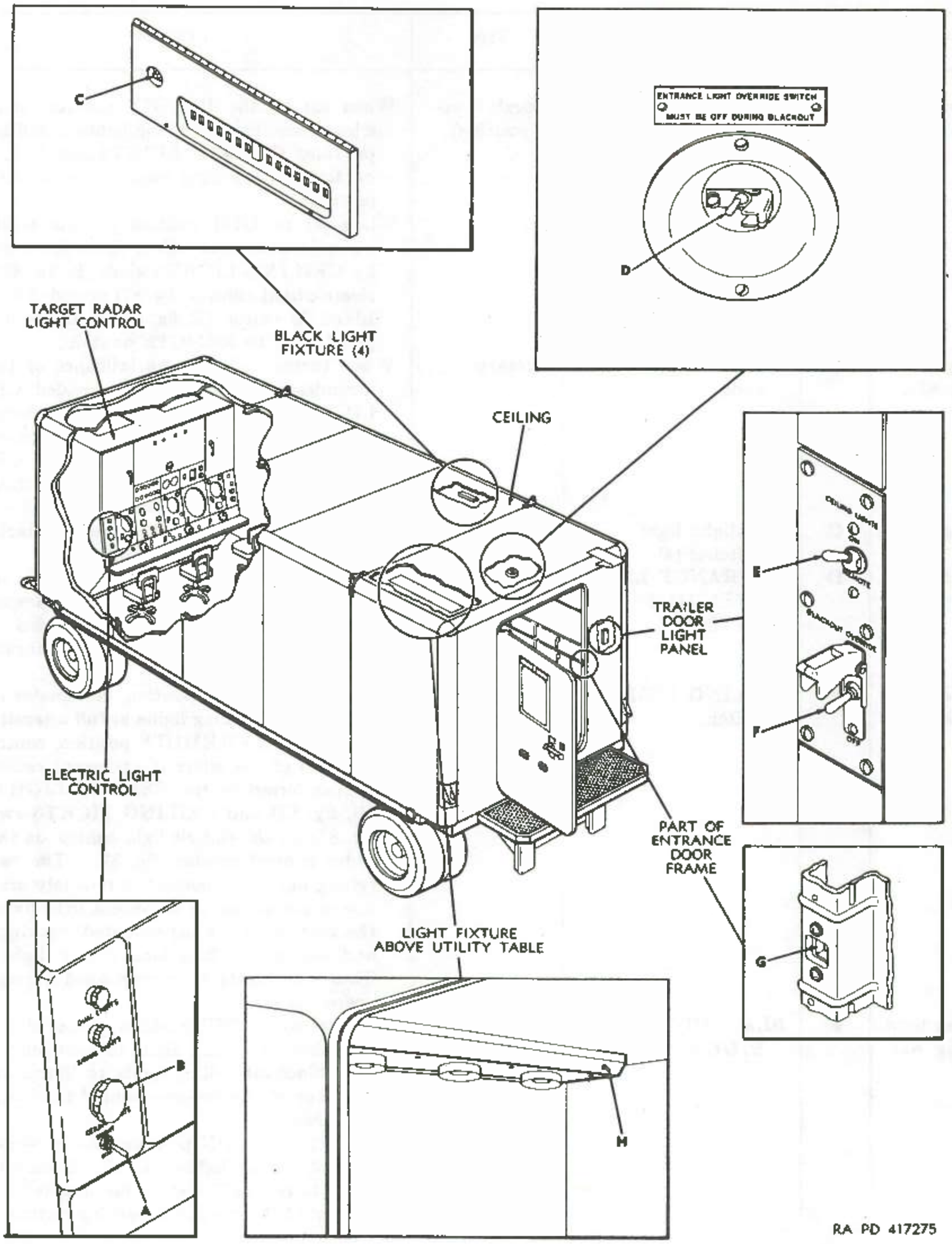


Figure 87. Trailer-mounted tracking station—lighting equipment—controls.

Location	Key to fig. 87	Control or indicator	Type	Function
Electric light control (fig. 87).	A	CEILING LIGHTS switch.	Toggle (two-position).	When set to the BRIGHT position, illuminates white incandescent ceiling lights at full brilliance provided CEILING LIGHTS switch (E, fig. 87) on trailer door light panel is set to REMOTE position. When set to DIM position permits brilliance of white incandescent ceiling lights to be controlled by CEILING LIGHTS knob (B, fig. 87) on the electric light control (fig. 87) provided CEILING LIGHTS switch (E, fig. 87) on trailer door light panel is set to REMOTE position.
Electric light control (fig. 87).	B	CEILING LIGHTS knob.	Rotary	When turned, adjusts the brilliance of the white incandescent ceiling lights provided CEILING LIGHTS switch (A, fig. 87) on the electric light control on the target radar control console is set to DIM position, and that the CEILING LIGHTS switch (E, fig. 87) on the trailer door light panel is set to REMOTE position.
Ceiling (fig. 87)	C	Blacklight light switches (4).	Pushbutton	When depressed, controls fluorescent blacklight in in associated blacklight fixture.
Ceiling (fig. 87)	D	ENTRANCE LIGHT OVERRIDE SWITCH.	Toggle (two-position, with guard).	When set to the ON position, controls white incandescent light in the first incandescent light fixture from door of trailer-mounted tracking station, provided all other white incandescent lights are illuminated.
Trailer door light panel (fig. 87).	E	CEILING LIGHTS switch.	Toggle (two-position).	When set to the ON position, illuminates all white incandescent ceiling lights at full intensity. When set to the REMOTE position, control of all but two of the white incandescent ceiling lights is transferred to the CEILING LIGHTS knob (B, fig. 87) and CEILING LIGHTS switch (A, fig. 87) on the electric light control on the target radar control console (fig. 87). The two white ceiling lights not controlled remotely are located one in the second incandescent light fixture from the rear of the trailer-mounted tracking station and one in the fifth incandescent light fixture. These two lights are extinguished during remote operation.
Trailer door light panel (fig. 87).	F	BLACKOUT OVERRIDE switch.	Toggle (two-position, with guard).	When set to the OFF position, causes all the white incandescent ceiling lights to extinguish, and all blue blackout ceiling lights to illuminate when the door of the trailer-mounted tracking station is opened. When set to the ON position, causes white incandescent ceiling lights and blue blackout ceiling lights to be unaffected by opening and closing of door of trailer-mounted tracking station.

Location	Key to fig. 87	Control or indicator	Type	Function
Entrance door frame (fig. 87).	G	Trailer door interlock switch.	Microswitch	Operates when door of trailer-mounted tracking station is open, causing white incandescent ceiling lights to extinguish and blue blackout ceiling lights to illuminate provided BLACKOUT OVERRIDE switch (F, fig. 87) is set to the OFF position.
Light fixture above utility table (fig. 87)	H	Light switch	Toggle (two-position).	When turned to the on (up) position illuminates the three incandescent white lights above the utility table.

b. Azimuth and Elevation Deviation Indicator. The indicators of the azimuth and elevation deviation indicator are shown on figure 93 and described in the associated legend.

c. Precision Indicator. The controls and indicators of the precision indicator (fig. 34) on the target radar control console are shown on figure 94 and described in the associated legend.

d. Target Test Control. The controls and indicators of the target test control (fig. 34) on the target radar control console are shown on figure 95 and described in the associated legend.

e. Target Track Control Drawer. The controls and indicators of the target track control drawer (fig. 34) on the target radar control console are shown on figure 96 and described in the associated legend.

f. Electric Light Control. The controls of the electric light control (fig. 34) on the target radar control console are shown on figure 97 and described in the associated legend.

g. Elevation, Azimuth or Range Indicator. The controls and indicators of the elevation indicator (fig. 34), the azimuth indicator and the range indicator are shown on figure 98 and described in the associated legend. The controls on each indicator are identical and perform the same function with respect to their associated indicator. Therefore, each control is described only once in the legend for figure 98. However, the dial on each of these indicators is different; therefore, the dial for each indicator is separately described in the legend associated with figure 98.

h. Target Track Control Power Supply. The controls and indicators of the target track control power supply (fig. 34) on the target radar control console are shown on figure 99 and described in the associated legend.

i. PPI. The controls and indicators of the PPI (fig. 34) of the target radar control console are shown on figure 100 and described in the associated legend.

j. Upper Center Access Door. The indicator lights on the upper center access door (fig. 34) of the target radar control console are shown on figure 101 and described in the associated legend.

77. Indicators of the Radar Set Group

Indicators of the radar set group (B, fig. 31) are viewed through two glass apertures (fig. 35) on the front of the radar set group cabinet. These indicators are shown on figure 102 and described in the associated legend.

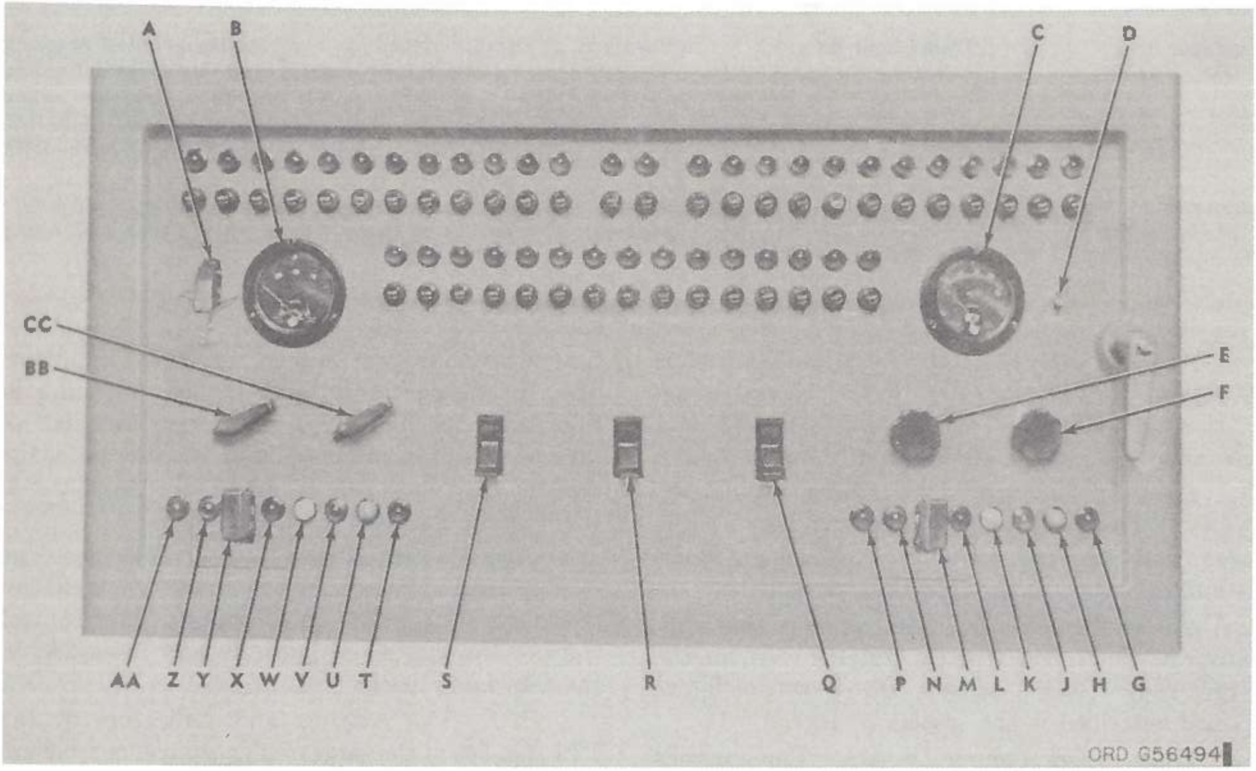


Figure 88 (U). Radar power control panel—controls and indicators.

Key to fig. 88	Control or indicator	Type	Function
A	BATTLE SHORT switch	Toggle (two-position, with guard).	When turned to the on (up) position, causes the interlock circuits and delay timers in the target- and missile-tracking radar systems to be electrically bypassed.
B	VOLTS CHECK meter		Indicates the amplitude of the target radar low voltage power supply output selected by the VOLTS CHECK-TARGET switch (BB, fig. 88), or the missile radar low voltage power supply output selected by the VOLTS CHECK-MISSILE switch (CC, fig. 88). Dial is graduated in quarter segments.
C	LINE VOLTS meter		Indicates the magnitude of each phase of the three-phase input line voltage as selected by the position of the PHASE switch (F, fig. 88). Meter scale is graduated from 0 to 150 volts in increments of 5 volts.
D	INTLK OVERRIDE switch	Toggle (two-position, spring-loaded to down position).	When operated to the on (up) position, causes all interlock switches in the trailer-mounted tracking station except the trailer door interlock switch (G, fig. 87) on the entrance door frame to be electrically bypassed.

Key to fig. 88	Control or indicator	Type	Function
E	ADJUST PHASE C knob	Rotary	When turned, adjusts the magnitude of phase C of the input line voltage as indicated on the LINE VOLTS meter (C, fig. 88).
F	PHASE switch	Rotary (three-position).	When set, its position determines which phase (A, B, C) of line voltage will be monitored on the LINE VOLTS meter (C, fig. 88).
G	MISSILE-HIGH VOLTS-ON indicator light.	Red	When illuminated, indicates that high voltage is being applied to the transmitter system of the missile-tracking radar system.
H	MISSILE-HIGH VOLTS-READY indicator light.	Green	When illuminated, indicates that high voltage may be applied to the transmitter system of the missile-tracking radar system.
J	MISSILE-HIGH VOLTS-HOT indicator light.	Amber	When illuminated, indicates that filaments of the high voltage circuits of the transmitter system of the missile-tracking radar system are hot.
K	MISSILE-HIGH VOLTS-PRE-HEAT indicator light.	White	When illuminated, indicates that filament voltage is being applied to the entire missile-tracking radar system. This light remains on for 5 minutes, which is the time necessary for filaments to properly heat.
L	MISSILE-PLATE VOLTS-ON indicator light.	Red	When illuminated, indicates plate voltage is being applied to all circuits of the missile-tracking radar system, except the high voltage circuits.
M	MISSILE-PLATE VOLTS switch.	Toggle (two-position).	When turned to the on (up) position, performs the following functions, provided filament voltage has been applied to the magnetron high voltage circuits for 5 minutes: *a.* Applies plate voltage to all circuits of the missile-tracking radar system, except the high voltage circuits of the magnetron. *b.* Illuminates MISSILE-PLATE VOLTS-ON indicator light (L, fig. 88). *c.* Extinguishes MISSILE-PLATE VOLTS-READY indicator light (N, fig. 88). *d.* Illuminates MISSILE-HIGH VOLTS-READY indicator light (H, fig. 88). *e.* Illuminates HV SUPPLY-READY indicator light (L, fig. 105) on the missile track control drawer (fig. 36) on the missile radar control console.
N	MISSILE-PLATE VOLTS-READY indicator light.	Amber	When illuminated, indicates that plate voltage may be applied to all circuits of the missile-tracking radar system except the high voltage circuits.
P	MISSILE-INTLK indicator light.	Blue	When illuminated, indicates that the missile-tracking radar system interlock circuits is closed. When extinguished, indicates interlock circuit is open or that high voltage is being applied to the transmitter system of the missile-tracking radar system.

Key to fig. 88	Control or indicator	Type	Function
Q	MISSILE POWER switch	Toggle (two-position, heavy-duty).	When set to the ON position, performs the following functions: *a.* Applies primary power to the missile-tracking radar system. *b.* Illuminates MISSILE-INTLK indicator light (P, fig. 88) immediately. *c.* Illuminates MISSILE-HIGH VOLTS-PREHEAT indicator light (K, fig. 88) within 5 seconds. *d.* Illuminates MISSILE-PLATE VOLTS-READY indicator light (N, fig. 88) within 20 to 30 seconds.
R	MAIN POWER switch	Toggle (two-position, heavy-duty).	When set to the ON position, performs the following functions: *a.* Makes three-phase power available to the target- and missile-tracking radar systems. *b.* Energizes all blowers in the target and missile track antenna-receiver-transmitter groups. *c.* Energizes radome inflation blower, provided the BLOWER switch (A, 1, fig. 110) is set to the ON position. *d.* Energizes the equipment cooling fan (fig. 18) provided EQUIP VENT switch (A, fig. 90) on the rear of the radar power control panel is set to the ON position. *e.* Makes power available to radar test set TS 847A/MSW–1 (fig. 53).
S	TARGET POWER switch	Toggle (two-position, heavy-duty).	When set to the ON position, performs the following functions: *a.* Applies primary power to the target-tracking radar system. *b.* Illuminates TARGET-INTLK indicator light (AA, fig. 88), immediately. *c.* Illuminates TARGET-HIGH VOLTS-PREHEAT indicator light (W, fig. 88) within 5 seconds. *d.* Illuminates TARGET-PLATE VOLTS-READY indicator light (Z, fig. 88) within 20 to 30 seconds.
T	TARGET-HIGH VOLTS-ON indicator light.	Red	When illuminated, indicates that high voltage is being applied to the transmitter system of the target-tracking radar system.
U	TARGET-HIGH VOLTS-READY indicator light.	Green	When illuminated, indicates that high voltage may be applied to the transmitter system of the target-tracking radar system.
V	TARGET-HIGH VOLTS-HOT indicator light.	Amber	When illuminated, indicates that filaments of the high voltage circuits of the transmitter system of the target-tracking radar system are hot.
W	TARGET-HIGH VOLTS-PREHEAT indicator light.	White	When illuminated, indicates that filament voltage is being applied to the entire target-tracking radar system. This light remains on for 5 minutes, which is the time necessary for filaments to properly heat.

Key to fig. 88	Control or indicator	Type	Function
X	TARGET-PLATE VOLTS-ON indicator light.	Red	When illuminated, indicates plate voltage is being applied to all circuits of the target-tracking radar system, except the high voltage circuits.
Y	TARGET-PLATE VOLTS switch.	Toggle (two-position).	When turned to the on (up) position, performs the following functions; provided filament voltage has been applied to the magnetron high voltage circuits for 5 minutes: a. Applies plate voltage to all circuits of the target-tracking radar system except the high voltage circuits of the magnetron. b. Illuminates TARGET-PLATE VOLTS-ON indicator light (X, fig. 88). c. Extinguishes TARGET-PLATE VOLTS-READY indicator light (Z, fig. 88). d. Illuminates TARGET-HIGH VOLTS-READY indicator light (U, fig. 88). e. Illuminates HV SUPPLY-READY indicator light (L, fig. 99) on the target-track control power supply (fig. 34) on the target radar control console.
Z	TARGET-PLATE VOLTS-READY indicator light.	Amber	When illuminated, indicates that plate voltage may be applied to all circuits of the target-tracking radar system except the high voltage circuits.
AA	TARGET-INTLK indicator light.	Blue	When illuminated, indicates that the missile-tracking radar system interlock circuit is closed. When extinguished, indicates that interlock circuit is open, or that high voltage is being applied to the transmitter system of the target-tracking radar system.
BB	VOLTS CHECK-TARGET switch.	Rotary (13-position).	When set to any one of its 13 positions, except the OFF position, switches the target-tracking radar low voltage power supply output, indicated by the switch setting, to VOLTS CHECK meter (B, fig. 88) for checking purposes, provided the VOLTS CHECK-MISSILE switch (CC, fig. 88) is set to the TARGET position.
CC	VOLTS CHECK-MISSILE switch.	Rotary (13-position).	When set to any one of its 13 positions, except the TARGET position, switches the missile-tracking radar system low voltage power supply, indicated by the switch setting, to VOLTS CHECK meter (B, fig. 88) for checking purposes.

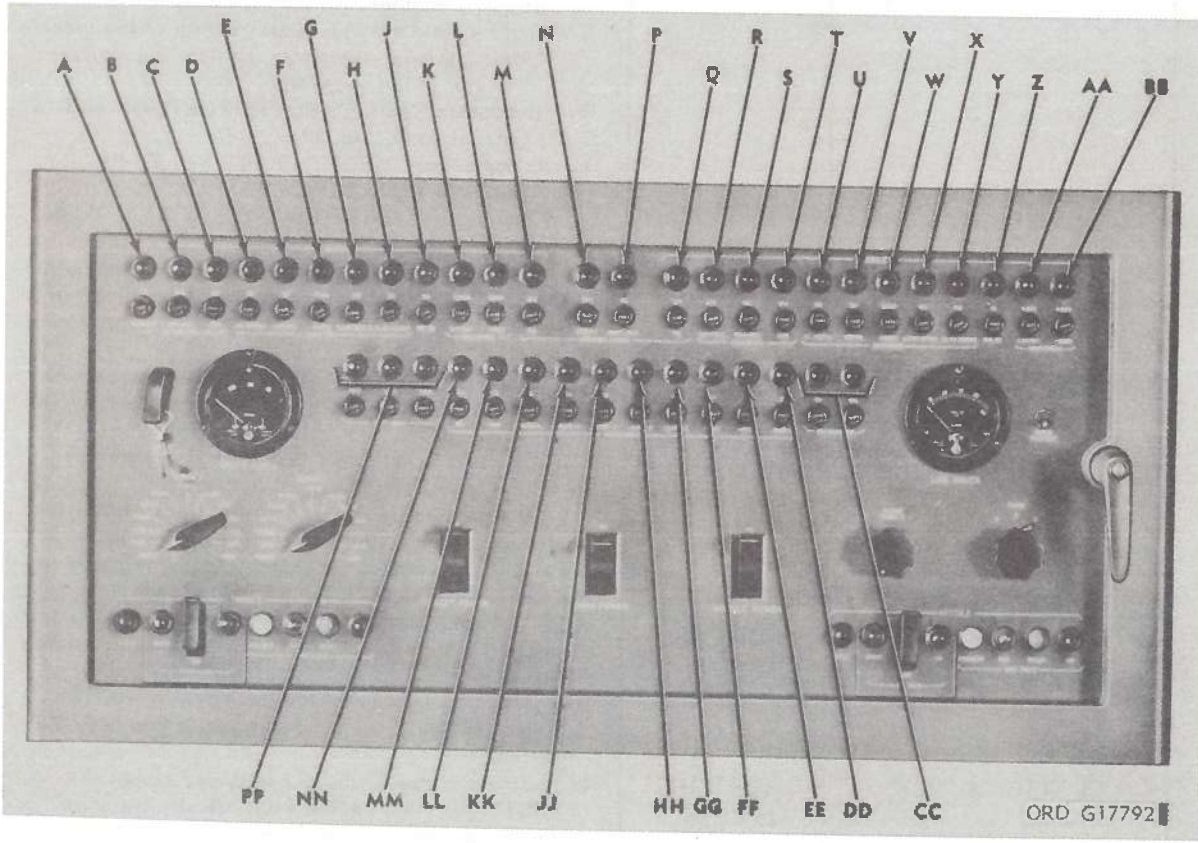


Figure 89. Radar power control panel - fuse indicator lights.

Key to fig. 89	Control or indicator	Type	Function
A	TARGET - FILAMENTS - CONSOLE fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
B	TARGET - FILAMENTS - RNG-REC fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
C	TARGET - FILAMENTS - ANT fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
D	TARGET-EXCITATION-AZ MOTOR fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
E	TARGET-EXCITATION-MOTOR fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
F	TARGET-EXCITATION-SERVO fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
G	TARGET-EXCITATION-AZ HP SERVO fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
H	TARGET-EXCITATION-EL HP SERVO fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
J	TARGET-IND HV fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
K	TARGET - RECTIFIERS-2.5&5 KV fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown
L	TARGET - RECTIFIERS- −500V fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
M	TARGET-STANDBY POWER-FIL fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
N	STANDBY POWER-UTILITY fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
P	STANDBY POWER-BLK LIGHT fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
Q	MISSILE-STANDBY POWER-FIL fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
R	MISSILE - FILAMENTS - CONSOLE fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
S	MISSILE - FILAMENTS - RNG-REC fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.

Key to fig. 89	Control or indicator	Type	Function
T	MISSILE - FILAMENTS - ANT fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
U	MISSILE-EXCITATION-AZ MOTOR fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
V	MISSILE-EXCITATION-MOTOR fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
W	MISSILE-EXCITATION-SERVO fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
X	MISSILE-EXCITATION-AZ HP SERVO fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
Y	MISSILE-EXCITATION-EL HP SERVO fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
Z	MISSILE-IND HV fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
AA	MISSILE - RECTIFIERS-2.5&5 KV fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
BB	MISSILE - RECTIFIERS −500V fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
CC	ACCESSORIES fuse in-indicator lights (2).	Red	When either one is illuminated, indicates that the fuse directly beneath it has blown.
DD	RECTIFIERS - BIAS B fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
EE	RECTIFIERS +270 fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
FF	RECTIFIERS +450V fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
GG	RECTIFIERS +320V B fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
HH	RECTIFIERS −320V B fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
JJ	RECTIFIERS +320V A fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
KK	RECTIFIERS −320V A fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
LL	RECTIFIERS-BIAS A fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
MM	RECTIFIERS-REG fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
NN	RECTIFIERS-FIL fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
PP	EQPT VENT fuse indicator lights (3).	Red	When any one is illuminated, indicates that the fuse directly beneath it has blown.

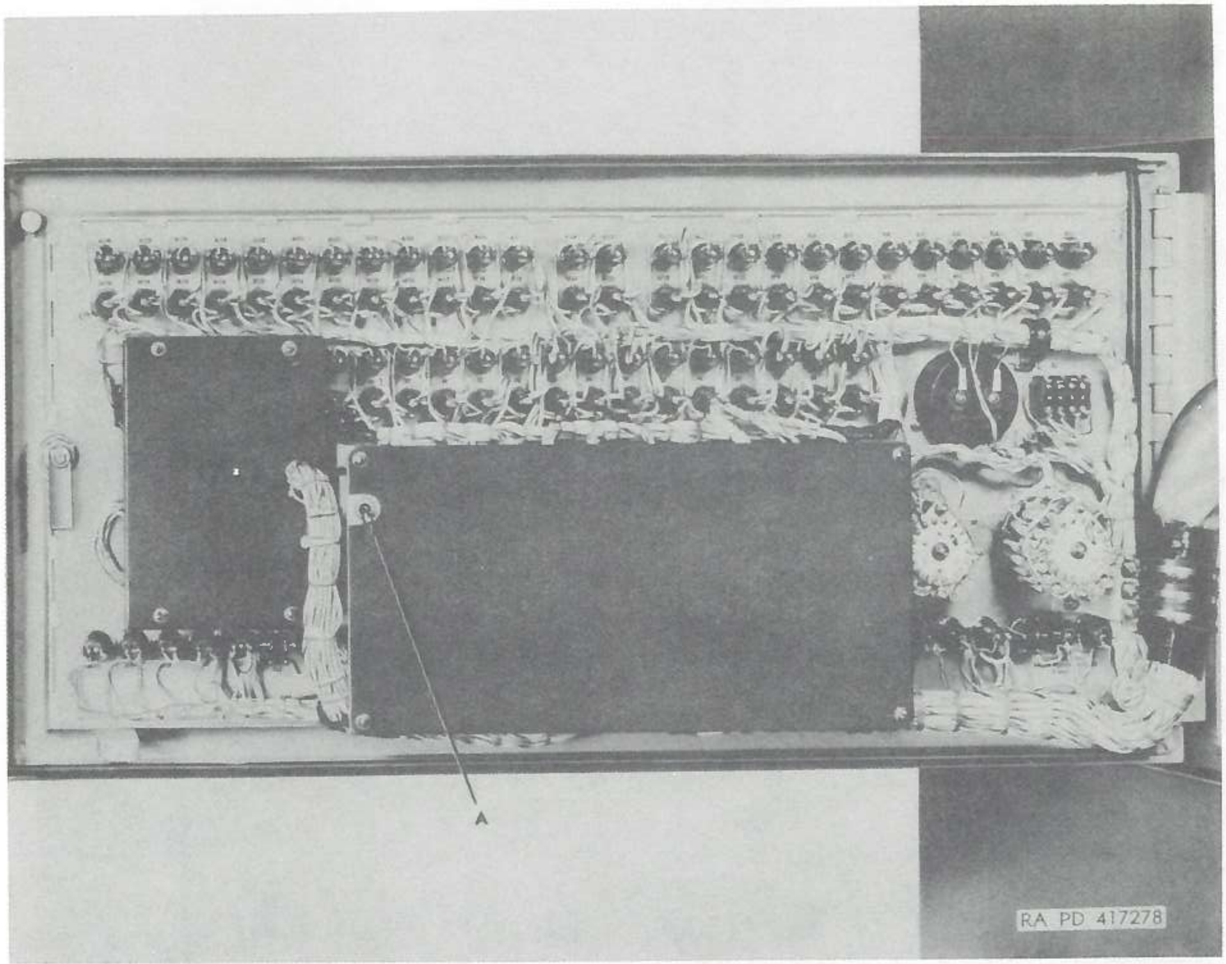


Figure 90. Radar power control panel—behind panel—controls.

Key to fig. 90	Control or indicator	Type	Function
A	EQPT VENT switch	Toggle (two-position).	When turned to the on (up) position, energizes the equipment cooling fan.

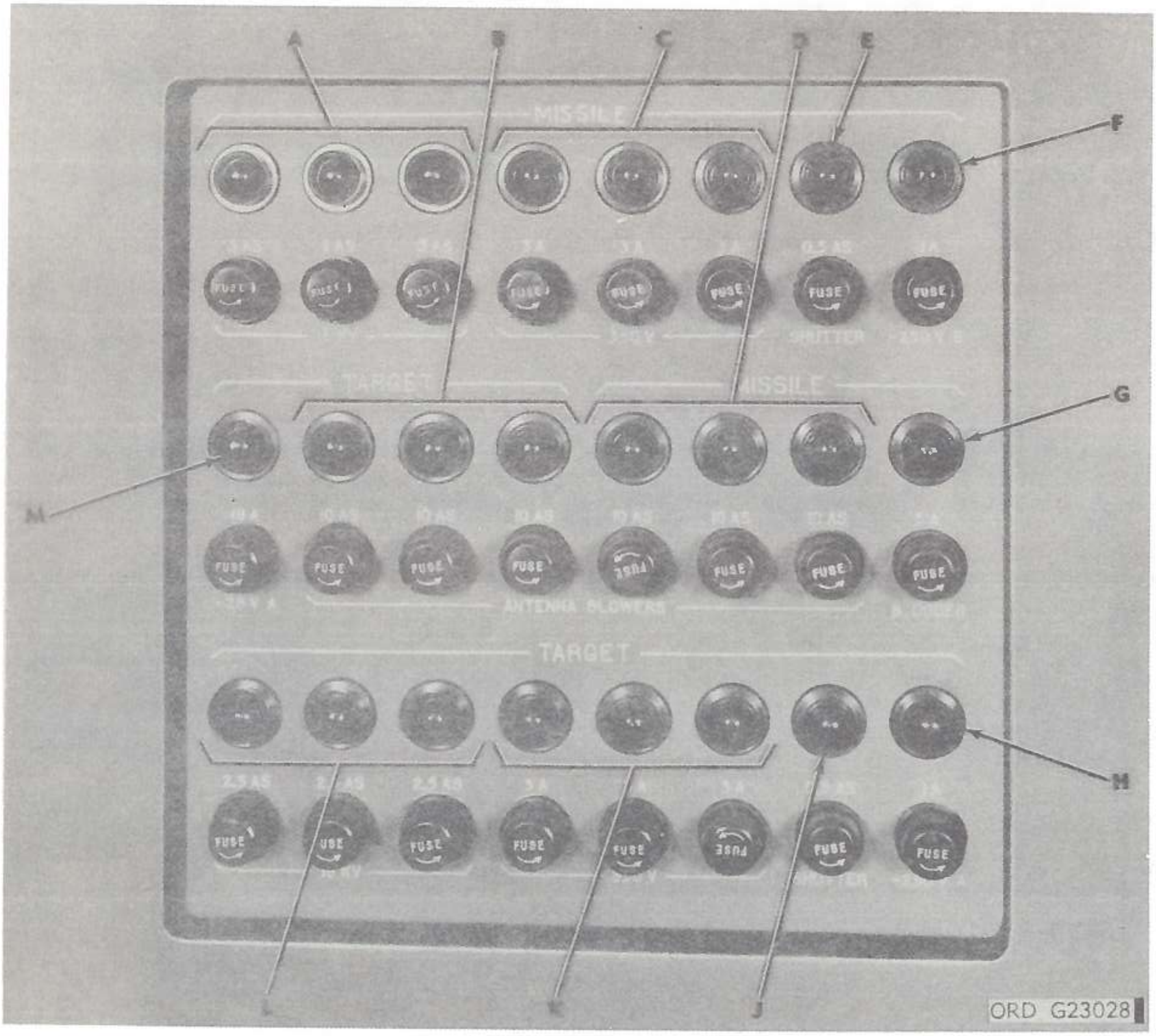


Figure 91. Missile and target fuse panel - fuse indicator lights.

Key to fig. 91	Control or indicator	Type	Function
A	MISSILE—18 KV fuse indicator lights (3).	Red	When any one of the three is illuminated, indicates that the fuse directly beneath it has blown.
B	TARGET—ANTENNA BLOWERS fuse indicator lights (3).	Red	When any one of the three is illuminated, indicates that the fuse directly beneath it has blown.
C	MISSILE—350V fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
D	MISSILE—ANTENNA BLOWERS fuse indicator lights (3).	Red	When any one of the three is illuminated, indicates that the fuse directly beneath it has blown.
E	MISSILE—SHUTTER fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
F	MISSILE—250V B fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
G	MISSILE—B CODER fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
H	TARGET—250V A fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
J	TARGET—SHUTTER fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.
K	TARGET—350V fuse indicator lights (3).	Red	When any one of the three is illuminated, indicates that the fuse directly beneath it has blown.
L	TARGET—18 KV fuse indicator lights (3).	Red	When any one of the three is illuminated, indicates that the fuse directly beneath it has blown.
M	TARGET—— 28VA fuse indicator light.	Red	When illuminated, indicates that the fuse directly beneath it has blown.

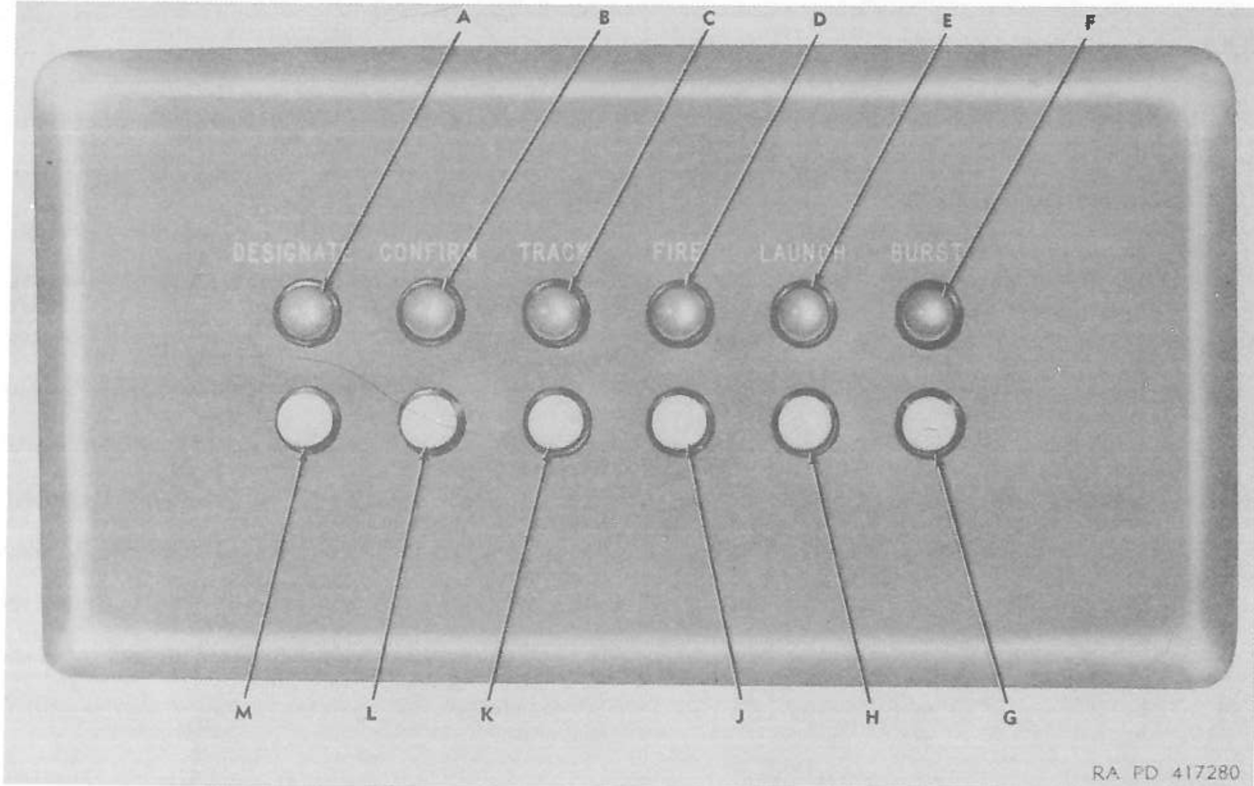


Figure 92. Target track indicator assembly—indicator lights.

Key to fig. 92	Control or indicator	Type	Function
A	DESIGNATE indicator light	Green	When illuminated, indicates that the identified target has been designated to the target-tracking radar system.
B	CONFIRM indicator light	Green	When illuminated, indicates the designated target is being acquired by the target-tracking radar system.
C	TRACK indicator light	Green	When illuminated, indicates that the acquired target is being tracked by the target-tracking radar system.
D	FIRE indicator light	Green	When illuminated, indicates that the fire order has been issued.
E	LAUNCH indicator light	Green	When illuminated, indicates that the designated missile has been launched.
F	BURST indicator light	Green	When illuminated, indicates that the burst order has been issued.
G	BURST indicator light	Ivory	When illuminated, indicates that no burst order has been issued.
H	LAUNCH indicator light	Ivory	When illuminated, indicates that no missile has been launched for the current engagement.
J	FIRE indicator light	Ivory	When illuminated, indicates that the fire order has not been issued.
K	TRACK indicator light	Ivory	When illuminated, indicates that no target is currently being tracked by the target-tracking radar system.
L	CONFIRM indicator light	Ivory	When illuminated, indicates that no target has been acquired by the target-tracking radar system.
M	DESIGNATE indicator light	Ivory	When illuminated, indicates that no target has been designated to the target-tracking radar system.

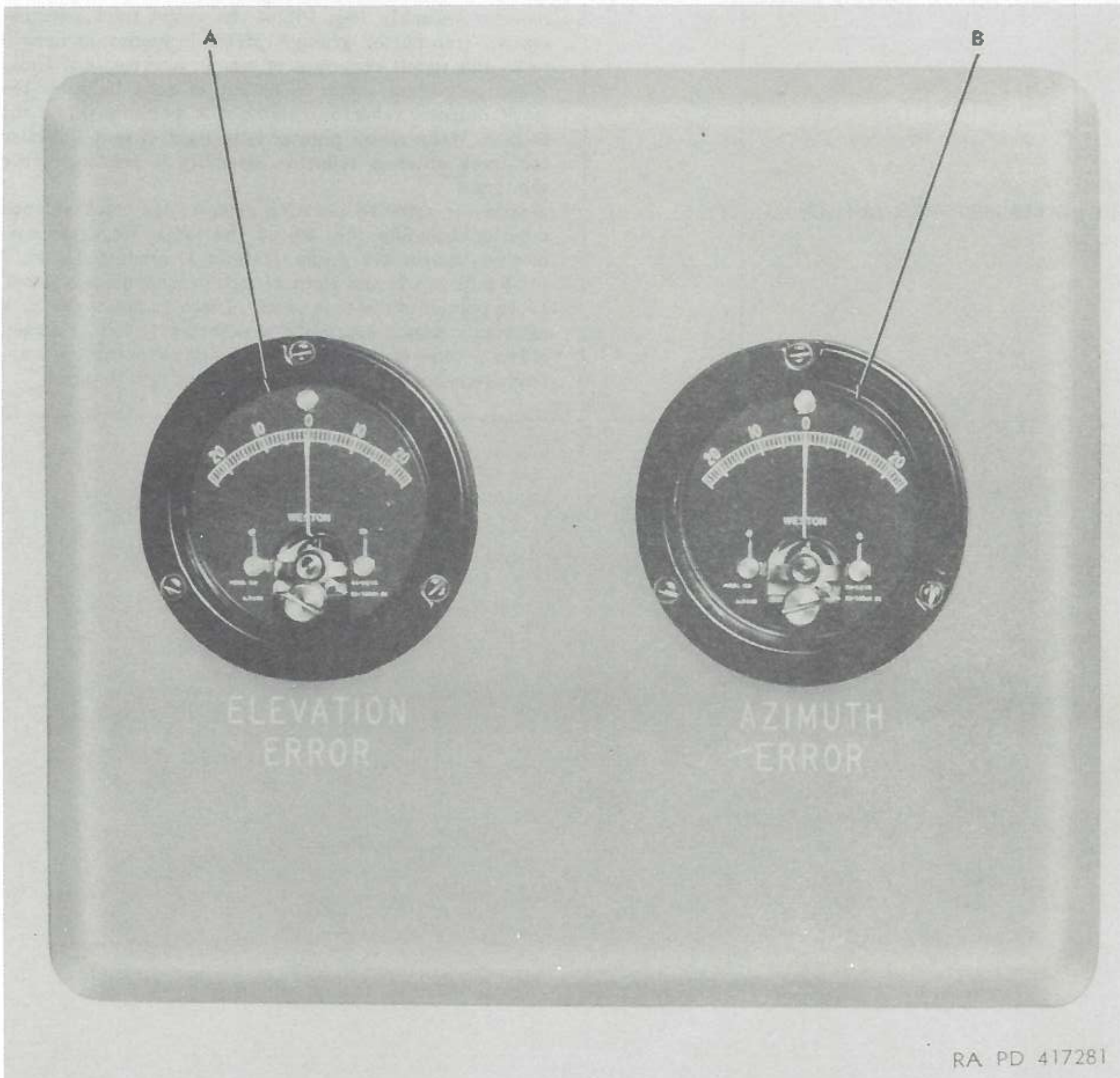


Figure 93. Azimuth and elevation deviation indicator—indicators.

Key to fig. 93	Control or indicator	Type	Function
A	ELEVATION ERROR meter	----------	Indicates the elevation pointing error of the track antenna reflector assembly (fig. 50) of the target track antenna-receiver-transmitter group. Meter is graduated from 0 to 25 mils to left and right of zero in increments of 1 mil. When pointer of meter is to left of zero, indicates the track antenna reflector assembly is pointing below the target. When meter pointer is to right of zero, indicates the track antenna reflector assembly is pointing above the target.
B	AZIMUTH ERROR meter	----------	Indicates the azimuth pointing error of the track antenna reflector assembly (fig. 50) of the target track antenna-receiver-transmitter group. Meter is graduated from 0 to 25 mils to left and right of zero in increments of 1 mil. When pointer of meter is to left of zero, indicates the track antenna reflector assembly is pointing to left of target. When pointer is to right of zero, indicates the track antenna reflector assembly is pointing to right of target.

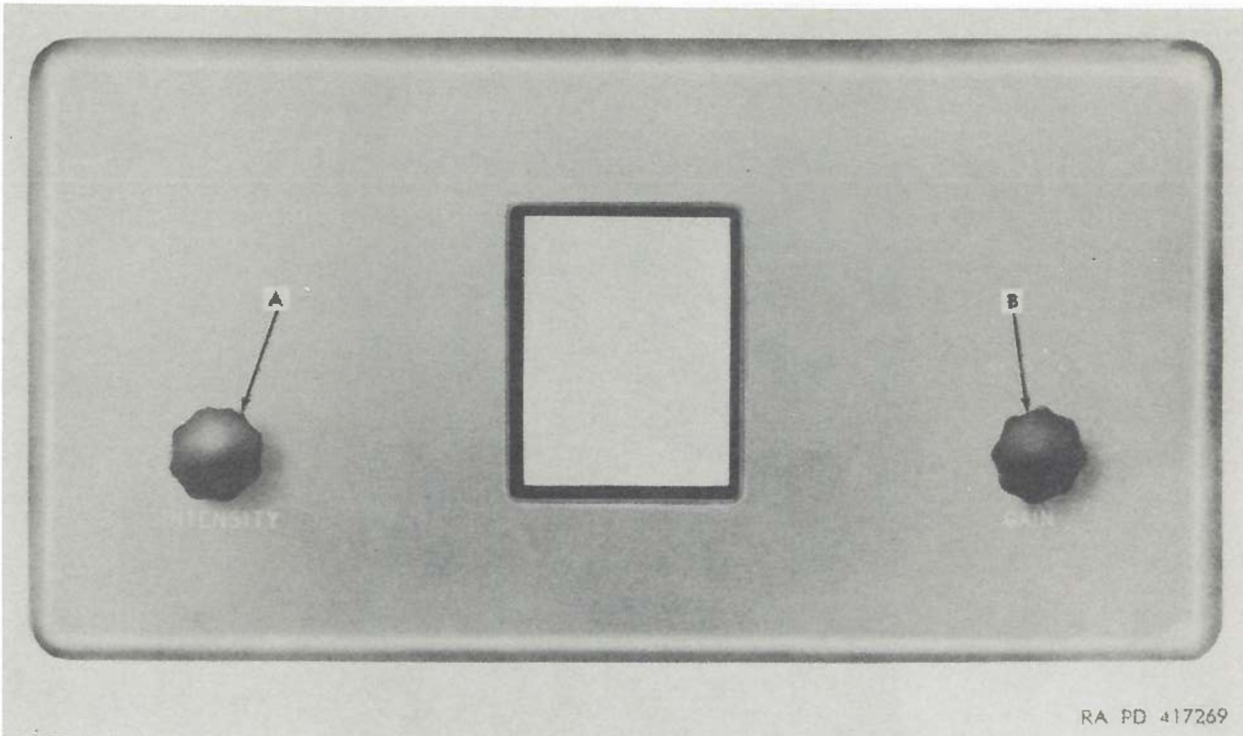


Figure 94. Precision indicator—(target radar control console)—controls and indicators.

Key to fig. 94	Control or indicator	Type	Function
A	INTENSITY knob	Rotary	When turned, adjusts the illumination of the sweep (B, fig. 115) on the precision indicator (fig. 34) on the target radar control console.
B	GAIN knob	Rotary	When turned, adjusts the intensity of the entire display (fig. 115) except the sweep (B, fig. 115) on the precision indicator (fig. 34) on the target radar control console.

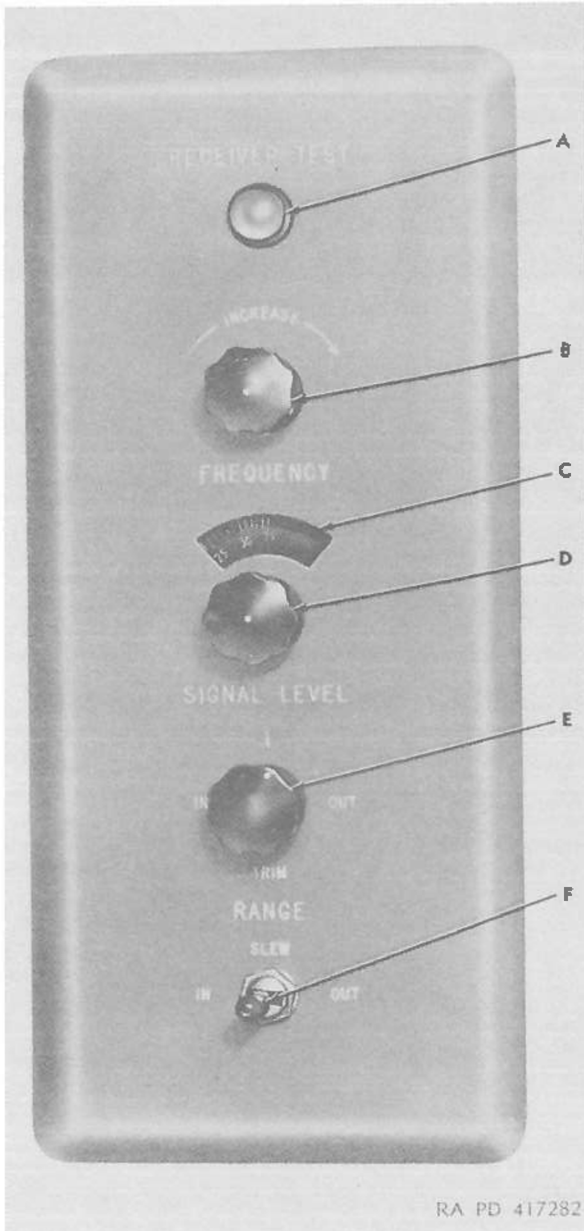


Figure 95. Target test control—controls and indicators.

Key to fig. 95	Control or indicator	Type	Function
A	RECEIVER TEST indicator light.	Red	When illuminated, indicates that TARGET-STANDBY-MISSILE switch (L, fig. 106) on the missile control-indicator group (fig. 36) on the missile radar control console is set to the TARGET position. Also indicates that the radar test set TS-847A/MSW-1 (fig. 53) is conditioned for testing the receiver system of the target-tracking radar system.
B	FREQUENCY knob	Rotary	When turned, adjusts the transmitting frequency of the target oscillator in the radar test set TS-847A/MSW-1 (fig. 53), provided the TARGET-STANDBY-MISSILE switch (L, fig. 106) on the missile control-indicator group (fig. 36) on the missile radar control console is set to the TARGET position.
C	SIGNAL LEVEL dial		Indicates the attenuation of the transmitted signal from the target oscillator of the radar test set TS-847A/MSW-1 (fig. 53). Dial is graduated from 0 to 35 db in increments of 1 db.
D	SIGNAL LEVEL knob	Rotary	When turned, adjusts the attenuation of the transmitted signal from the target oscillator of the radar test set TS-847A/MSW-1 (fig. 53) as indicated by the SIGNAL LEVEL dial (C, fig. 95).
E	RANGE - TRIM knob	Rotary	When turned, permits fine adjustment of the simulated range of the radio frequency signal produced by the target oscillator in the radar test set TS-847A/MSW-1 (fig. 53).
F	RANGE-SLEW switch	Toggle (three-position, spring-loaded to center position).	When operated to the out (right) position, increases the simulated range of the radio frequency signal produced by the target oscillator in radar test set TS-847A/MSW-1 (fig. 53). When operated to the in (left) position, decreases the simulated range of the radio frequency signal produced by the target oscillator in the radar test set TS-847A/MSW-1 (fig. 53). When released from either the left or right position to the center position, causes the simulated range of the radio frequency signal produced by the target oscillator in radar test set TS-847A/MSW-1 to remain at the value indicated by the range dial (D, fig. 98) on the range indicator (fig. 34) on the target radar control console, at the time the switch was released.

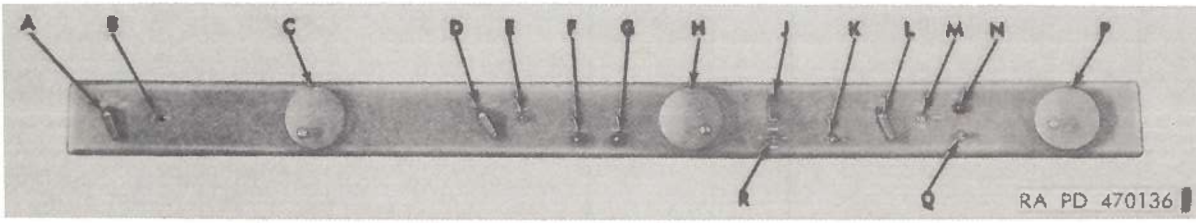


Figure 96. Target track control drawer - controls and indicators.

Key to fig. 96	Control or indicator	Type	Function
A	Elevation MAN-AID-AUTO switch.	Rotary (three-position).	When set to the MAN position, permits the track antenna reflector assembly (fig. 50) associated with the target-tracking radar system to be positioned up or down in elevation at a rate directly proprotional to the manual rotation of the elevation handwheel (C, fig. 96). When set to the AID position, permits the track antenna reflector assembly (fig. 50) associated with the target-tracking radar system to continue to move up or down in elevation automatically after release of the elevation handwheel (C, fig. 96). The rate and direction which the track antenna reflector assembly moves remains the same as it was at the time the elevation handwheel was released. When set to the AUTO position, causes the track antenna reflector assembly (fig. 50) associated with the target-tracking radar system to automatically remain positioned to the elevation angle of the target being tracked.
B	Elevation SLEW switch - - -	Toggle (three-position spring-loaded to center position).	When operated, moves the track antenna reflector assembly (fig. 50) associated with the target-tracking radar system, up or down in elevation at a more rapid rate than is provided by rotating the elevation handwheel (C, fig. 96).
C	Elevation handwheel - - - - -	Rotary- - - -	When rotated, positions the track antenna reflector assembly (fig. 50) associated with the target-tracking radar system, up or down in elevation, provided the elevation MAN-AID-AUTO switch (A, fig. 96) is set to either the MAN or the AID position.
D	Azimuth MAN-AID-AUTO switch.	Rotary (three-position).	When set to the MAN position, causes the track antenna reflector assembly (fig. 50) associated with the target-tracking radar system to be positioned in azimuth at a rate directly proportional to the manual rotation of the azimuth handwheel (H, fig. 96)

Key to fig. 96	Control or indicator	Type	Function
			When set to the AID position, causes the track antenna reflector assembly (fig. 50) associated with the target-tracking radar system to continue to move in azimuth automatically after release of the azimuth handwheel (H, fig. 96). The rate and direction at which the track antenna reflector assembly moves remains the same as it was at the time the azimuth handwheel was released. When set to the AUTO position, causes the track antenna reflector assembly (fig. 50) associated with the target-tracking radar system to automatically remain positioned to the azimuth angle of the target being tracked.
E	ACQUIRE switch - - - - - -	Toggle (two-position, spring-loaded to right position).	When operated, performs the following functions: a. Automatically slews the azimuth and range circuits of the target-tracking radar system to the azimuth and range of the designated target. b. Illuminates the green CONFIRM indicator light (B, fig. 92) and extinguishes the ivory CONFIRM indicator light (L, fig. 92) on the target track indicator assembly (fig. 34) on the target radar control console. c. Illuminates the green TARGET-CONFIRMED indicator light (R, 1, fig. 77) and extinguishes the ivory TARGET-CONFIRMED indicator light (K, 2, fig. 77) on the battery signal panel-indicator (fig. 24) on the battery-control console.
F	OFF TARGET switch - - -	Pushbutton -	When depressed, performs the following functions, which indicate that the target-tracking radar system is off target in at least one coordinate: a. Illuminates ivory TRACK indicator light (K, fig. 92) and extinguishes green TRACK indicator light (C, fig. 92) on the target track indicator assembly (fig. 34) on the target radar control console. b. Illuminates ivory TARGET-TRACKED indicator light (L, 2, fig. 77) and extinguishes green TARGET-TRACKED indicator light (S, 1, fig. 77) on the battery signal panel-indicator (fig. 24) on the battery-control console.
G	TRACKED switch - - - - -	Pushbutton	When depressed, performs the following functions, which indicate that the target-tracking radar system is on target in all three coordinates:

Key to fig. 96	Control or indicator	Type	Function
			a. Illuminates green TRACK indicator light (C, fig. 92) and extinguishes ivory TRACK indicator light (K, fig. 92) on the target track indicator assembly (fig. 34) on the target radar control console. b. Illuminates green TARGET-TRACKED indicator light (S, 1, fig. 77) and extinguishes ivory TARGET-TRACKED indicator light (L, 2, fig. 77) on the battery signal panel-indicator (fig. 24) on the battery-control console.
H	Azimuth handwheel- - - - - -	Rotary- - - -	When rotated, positions the track antenna reflector assembly (fig. 50) associated with the target-tracking radar system in azimuth, provided the azimuth MAN-AID-AUTO switch (D, fig. 96) is set to either the MAN or the AID position.
J	TEST switch - - - - - - - - - -	Toggle (two-position, with guard).	When set to the TEST position, places the target-tracking radar system in the test condition. When turned to the down position, permits normal operation of the target-tracking radar system. Switch is normally left in down position.
K	Range SLEW switch - - - - - -	Toggle (three-position, spring-loaded to center position).	When operated, causes the range circuits of the target-tracking radar system to slew in or out in range at a more rapid rate than is provided by rotating the range handwheel (P, fig. 96).
L	Range MAN-AID-AUTO switch	Rotary (three-position).	When set to the MAN position, permits target range, represented by the range circuits of the target-tracking radar system, to increase or decrease at a rate directly proportional to the manual rotation of the range handwheel (P, fig. 96). When set to the AID position, permits target range, represented by the range circuits of the target-tracking radar system, to automatically increase or decrease after release of the range handwheel (P, fig. 96). The rate at which the range increases or decreases remains the same as it was at the time the range handwheel was released. When set to the AUTO position, causes target range, represented by the range circuits of the target-tracking radar system to automatically remain the same as the range of the target being tracked.

Key	Control or indicator	Type	Function
M	RANGE switch	Toggle (three-position)	When set to the NORMAL position, permits normal operation of the range circuits of the target tracking radar system. When set to the CALIBRATE position, permits calibration of the range circuits of the target tracking radar system. When set to the ZERO position, permits zeroing of the range circuits of the target tracking radar system.
N	VIDEO AMP indicator	Red	When illuminated, indicates VIDEO AMP switch (Q, fig. 96) is set to X3 or X6 position to obtain increased target video gain to azimuth, elevation, and range indicators.
P	Range handwheel	Rotary	When rotated, causes the target range represented by the range circuits of the target tracking radar system to increase or decrease, provided the range MAN-AID-AUTO switch (L, fig. 96) is set to either the MAN or the AID position.
Q	VIDEO AMP switch	Toggle (three-position)	When set to OFF position, conditions video amplifier to provide target video at normal gain to azimuth elevation, and range indicators. When set to X3 position, conditions video amplifier to provide target video at 10 db above normal gain to azimuth, elevation, and range indicators. When set to X6, conditions video amplifier to provide video at 15 db above normal target gain to azimuth, elevation, and range indicators.
R	SERVOS switch	Toggle (three-position)	When set to the off (center) position, permits normal operation of the target tracking radar system. When set to the INC position, applies a constant automatic tracking rate to the azimuth, elevation, and range servos of the target tracking radar system for use during testing. This rate is in a positive direction. When set to the DEC position, applies a constant automatic tracking rate to the azimuth, elevation, and range servos of the target tracking radar system for use during testing. This rate is in a negative direction.

Figure 96 (U). Target track control drawer—controls and indicators—legend—continued.

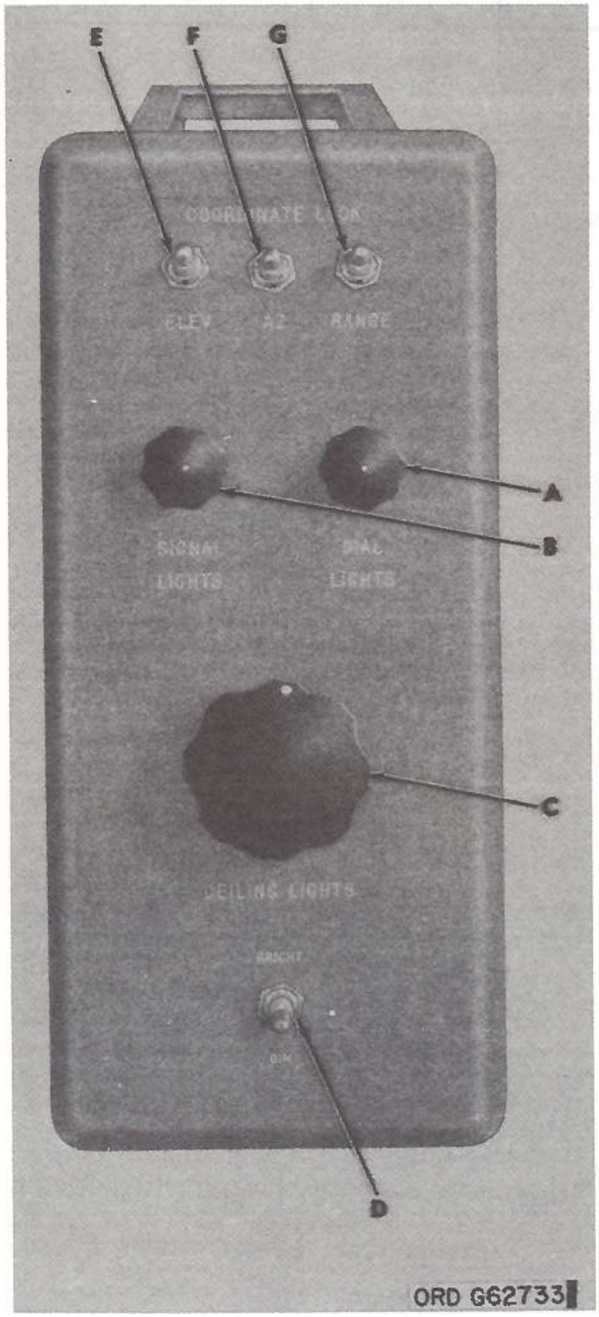


Figure 97 (U). Electric light control—controls.

Key to fig. 97	Control or indicator	Type	Function
A	DIAL LIGHTS knob	Rotary	When turned, adjusts the illumination of the azimuth dial (D, fig. 98), elevation dial, and range dial on the azimuth indicator (fig. 34), elevation indicator, and range indicator respectively on the target radar control console.
B	SIGNAL LIGHTS knob	Rotary	When turned, adjusts the brilliance of all illuminated indicator lights (fig. 92) on the target track indicator assembly (fig. 34).
C	CEILING LIGHTS knob	Rotary	When turned, adjusts the brilliance of the white incandescent ceiling lights, provided CEILING LIGHTS switch (D, fig. 97) is set to the DIM position, and CEILIN G LIGHTS switch (E, fig. 87) on the trailer door light panel is set to the REMOTE position.
D	CEILING LIGHTS switch	Toggle (two-position)	When set to the BRIGHT position, illuminates the white incandescent ceiling lights at full brilliance, provided CEILING LIGHTS switch (E, fig. 87) on the trailer door light panel is set to the REMOTE position. When set to the DIM position, permits brilliance of the white incandescent ceiling lights to be controlled by CEILING LIGHTS knob (C, fig. 97), provided CEILING LIGHTS switch (E, fig. 87) on the trailer door light panel is set to the REMOTE position.
E	ELEV switch	Toggle (two-position)	When set to the COORDINATE LOCK position, locks the track antenna reflector assembly (fig. 50) associated with the target tracking radar system at the elevation coordinate set by the local antenna control.
F	AZ switch	Toggle (two-position)	When set to the COORDINATE LOCK position, locks the track antenna reflector assembly (fig. 50) associated with the target tracking radar system at the azimuth coordinate set by the local antenna control.
G	RANGE switch	Toggle (two-position)	When set to the COORDINATE LOCK position, locks the target range represented by the range circuits of the target tracking radar system at the range set by the range handwheel (P, fig. 96).

Figure 97 (U). Electric light control—controls—legend.

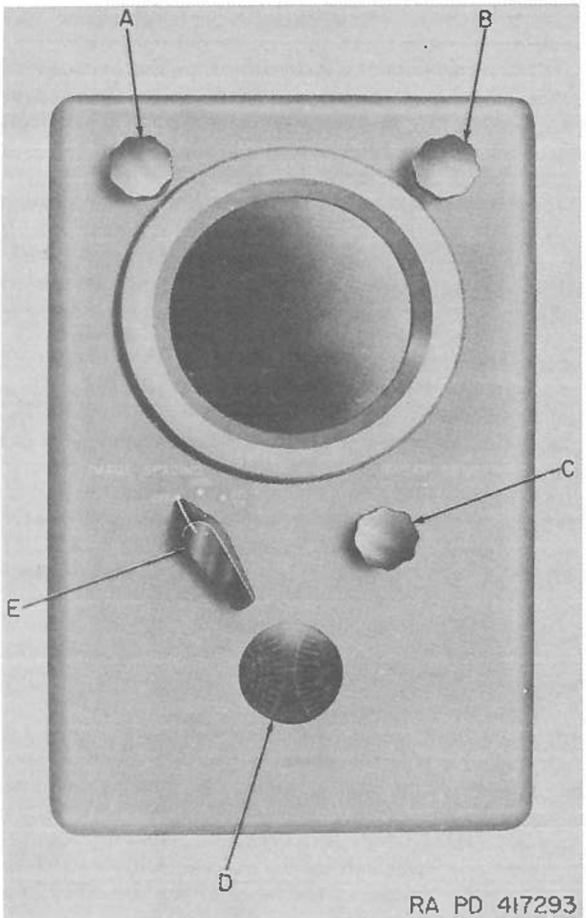


Figure 98. (U). Elevation, azimuth, or range indicator—controls and indicators—systems 1201 and below.

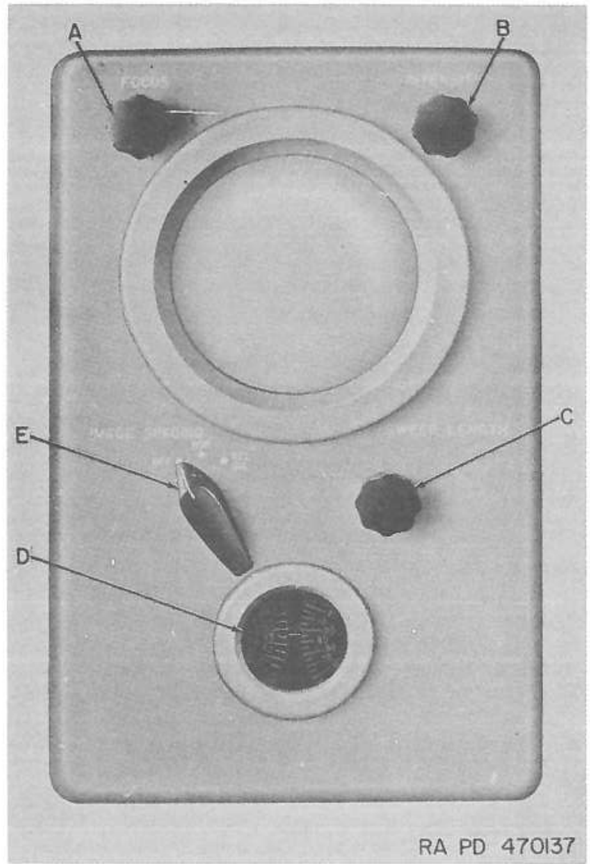


Figure 98.1 (U). Elevation, azimuth, or range indicator—controls and indicators—systems 1202 and above.

Key to fig. 98 and 98.1	Control or indicator	Type	Function
A	FOCUS knob	Rotary	When turned, adjusts the clearness and sharpness of the indicator presentation.
B	INTENSITY knob	Rotary	When turned, adjusts the brilliance of the indicator presentation.
C	SWEEP LENGTH knob	Rotary	When turned, varies, from 40,000 to 200,000 yards, the range represented by the upper baseline (fig. 119) for the elevation or azimuth indicator presentation, or by the baseline (fig. 121) for the range indicator presentation.
D	Elevation, azimuth or range dial		Elevation dial: Indicates the elevation angle of the track antenna reflector assembly (fig. 50) of the target track antenna-receiver-transmitter group. The dial is graduated from 0 to 6400 mils in increments of 5 mils. Azimuth dial: Indicates the azimuth angle of the track antenna reflector assembly (fig. 50) of the target track antenna-receiver-transmitter group. The dial is graduated from 0 to 6400 mils in increments of 5 mils. Range dial: Indicates the target range represented by the range circuits of the target-tracking radar system. The dial is graduated from 0 to 200,000 yards in increments of 10 yards.
E	IMAGE SPACING switch	Rotary (three-position).	Elevation or azimuth indicator. When set to the OFF or NOR position, two baselines extend across the face of the cathode-ray tube, as shown on figure 119. When set to the SEL SIG position, the presentation on the cathode-ray tube appears the same as when the switch is in the NOR position except the baselines on either side of each 500-yard expanded sweep are not visible. This type presentation is shown on figure 120. *Note.* For a detailed explanation of the elevation or azimuth indicator presentation with IMAGE SPACING switch in each of its three positions, refer to paragraph 88c. When set to either the OFF or NOR position, a single baseline extends across the face of the cathode-ray tube as shown on figure 121. When set to the SEL SIG position, the presentation on the cathode-ray tube appears the same as when the switch is set to the OFF or NOR position, except the baseline on either side of the 500-yard expanded sweep is not visible. This type presentation is shown on figure 122. *Note.* For a detailed explanation of the range indicator presentation with IMAGE SPACING switch set to the OFF or NOR, or the SEL SIG positions, refer to paragraph 88d.

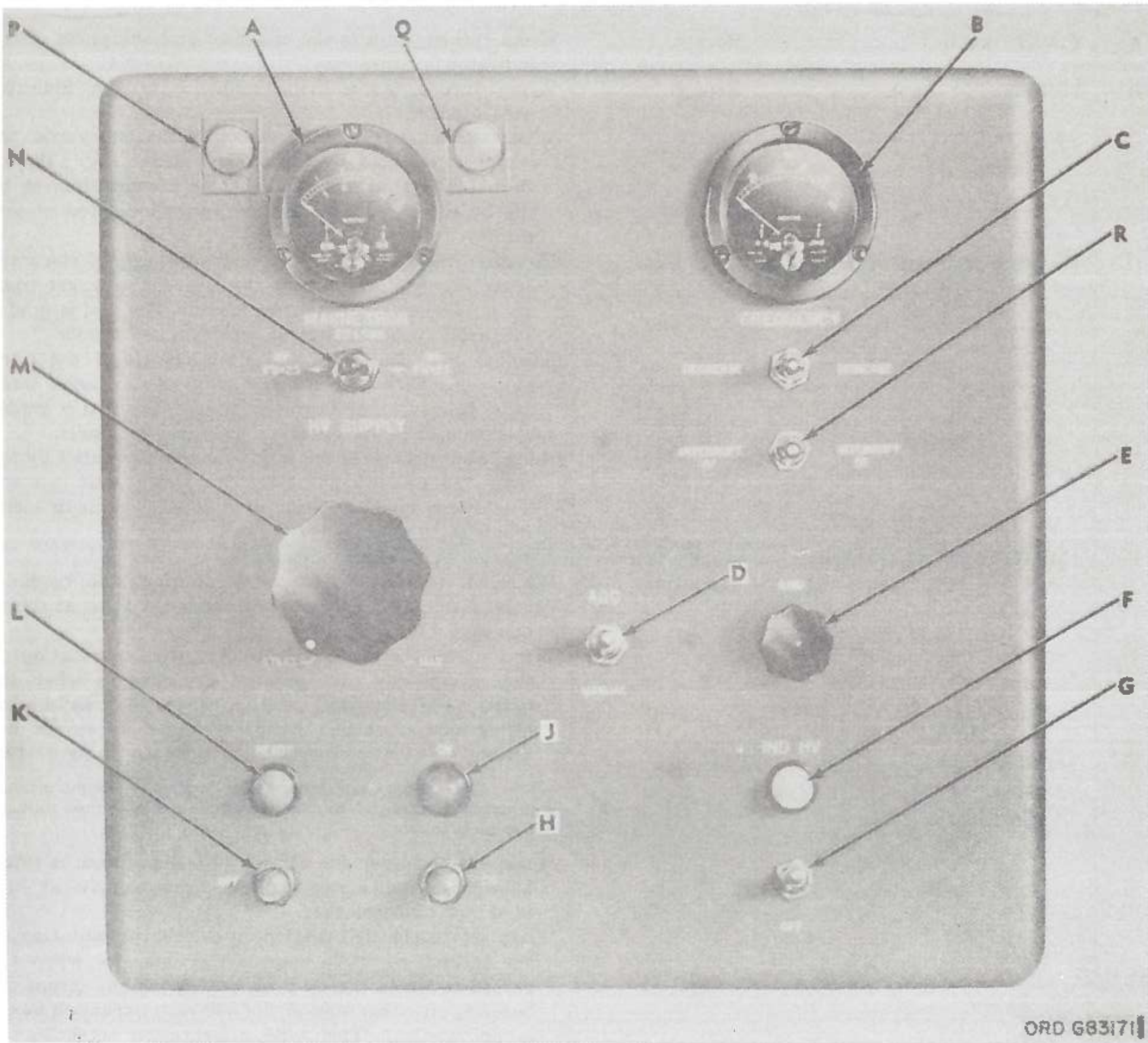


Figure 99 (U). Target track control power supply—controls and indicators.

Key to fig. 99	Control or indicator	Type	Function
A	MAGNETRON meter - - - -	- - - - - -	Indicates magnitude of average magnetron current of the target-tracking radar system, magnitude of high voltage applied to transmitter system of the target-tracking radar system, or magnitude of current of high voltage power supply of the target-tracking radar system, as determined by the position of the MAGNETRON switch (N, fig. 99). The meter has two scales. The top scale is graduated from 0 to 5 in increments of 0.2; the lower scale is graduated from 0 to 25 in increments of 1.
B	FREQUENCY meter - - - -	- - - - -	Indicates the relative frequency at which the magnetron of the target-tracking radar system is operating. The meter is graduated from 0 to 100 megacycles in increments of 5 megacycles.
C	FREQUENCY switch - - - -	Toggle (three-position, spring-loaded to center position).	When operated to the DECREASE position, decreases the frequency of the magnetron of the target-tracking radar system to a minimum of 8500 megacycles. When operated to the INCREASE position, increases the frequency of the magnetron of the target-tracking radar system to a maximum of 9600 megacycles. When released from either the INCREASE OR DE-CREASE position, causes the magnetron of the target-tracking radar system to operate at the frequency indicated on the FREQUENCY meter (B, fig. 99).
C.1	INTERRUPT RF switch - - -	Toggle (three-position, spring-loaded to center position).	When operated to either INTERRUPT RF position (left or right from center), causes the rf energy from the target transmitter to be transferred from the target antenna to the dummy load. Operation of the INTERRUPT RF switch is discussed in TM 9-1430-250-10/1.
D	AGC-MANUAL switch - - - -	Toggle (two-position).	When set to the AGC position, causes the automatic gain control (AGC) circuits to automatically control the gain of the receiver system of the target-tracking radar system. When set to the MANUAL position, permits the gain of the receiver system of the target-tracking radar system to be controlled by the GAIN knob (E, fig. 99), provided the TEST switch (K, fig. 96) on the target track control drawer (fig. 34) on the target radar control console is in the up position.
E	GAIN knob - - - - - - - - - -	Rotary - -	When turned, adjusts the gain of the receiver system of target-tracking radar system, provided the AGC-MANUAL switch (D, fig. 99) is in the MANUAL position, and the TEST switch (K, fig. 96) on the target track control drawer (fig. 34) on the target radar control console is in the up position.
F	IND HV indicator light - - -	White - -	When illuminated, indicates that high voltage is being applied to the PPI (fig. 34), precision indicator, elevation indicator, azimuth indicator, and range indicator on the target radar control console.

Key to fig. 99	Control or indicator	Type	Function
G	IND HV switch - - - - - - -	Toggle (two-position).	When turned to the on (up) position, applies high voltage to the PPI (fig. 34), precision indicator, elevation indicator, azimuth indicator, and range indicator on the target radar control console, and illuminates the IND HV indicator light (F, fig. 99).
H	HV SUPPLY-ON switch - -	Push-button	When depressed, applies high voltage to the transmitter system of the target-tracking radar system. Illuminates HV SUPPLY-ON indicator light (J, fig. 99), and the TARGET-HIGH VOLTS-ON indicator light (T, fig. 88) on the radar power control panel (fig. 33). Extinguishes the HV SUPPLY-READY indicator light (L, fig. 99), and extinguishes the following indicator lights on the radar power control panel: a. TARGET-HIGH VOLTS-READY indicator light (U, fig. 88). b. TARGET-HIGH VOLTS-HOT indicator light (V, fig. 88). c. TARGET-HIGH VOLTS-PREHEAT indicator light (W, fig. 88). d. TARGET-INTLK indicator light (AA, fig. 88).
J	HV SUPPLY-ON indicator light.	Red - - -	When illuminated, indicates that high voltage is being applied to the transmitter system of the target-tracking radar system.
K	HV SUPPLY-OFF switch.	Push-button	When depressed, removes high voltage from the transmitter system of the target-tracking radar system. Extinguishes HV SUPPLY-ON indicator light (J, fig. 99), and the TARGET-HIGH VOLTS-ON indicator light (T, fig. 88) on the radar power control panel (fig. 33). Illuminates the HV SUPPLY-READY indicator light (L, fig. 99), and illuminates the following indicator lights on the radar power control panel: a. TARGET-HIGH VOLTS-READY indicator light (U, fig. 88). b. TARGET-HIGH VOLTS-HOT indicator light (V, fig. 88). c. TARGET-HIGH VOLTS-PREHEAT indicator light (W, fig. 88). d. TARGET-INTLK indicator light (AA, fig. 88).
L	HV SUPPLY-READY indicator light.	Green - -	When illuminated, indicates that high voltage may be applied to the transmitter system of the target-tracking radar system.
M	HV SUPPLY knob - - - - - -	Rotary - -	When turned, adjusts high voltage applied to the transmitter system of the target-tracking radar system, as indicated on the MAGNETRON meter (A, fig. 99). (Must be in START position, fully counterclockwise, before high voltage can be applied to the transmitter system).

Key	Control or indicator	Type	Function
N	MAGNETRON switch........	Lever (three-position, spring-loaded to center position.)	When operated to the KV FS=25 position, causes the MAGNETRON meter (A, fig. 99) to indicate the magnitude of high voltage being applied to the magnetron of the transmitter system of the target tracking radar system. For this position of the switch, the lower scale of the meter is read in kilovolts. The meter scale is graduated from 0 to 25, in increments of 1000 volts. When set the FS 5MA position, causes the MAGNETRON meter (A, fig. 99) to indicate the average current of the magnetron. For this position of the switch, the upper scale of the meter is read in milliamperes. The meter scale is graduated from 0 to 5, in increments of 0.2 milliamperes. When operated to the MA FS=25 position, causes the MAGNETRON meter (A, fig. 99) to indicate average current of the magnetron high voltage power supply of the target tracking radar system. For this position of the switch, the lower scale of the meter is read in milliamperes. The meter scale is graduated from 0 to 25, in increments of 1 milliampere.
P	AAR indicator light (selected systems only)..............	Yellow	When illuminated, indicates the target tracking radar system is synchronized at the auxiliary acquisition radar (AAR) prf rate of 400 pps.
Q	NAR indicator light (selected systems only)..............	Green	When illuminated, indicates the target tracking radar system is synchronized at the Nike acquisition radar (NAR) prf rate of 500 pps.

Figure 99 (U). Target track control power supply—controls and indicators—legend—Continued.

78 (U). Operating Controls and Indicators of the Missile Radar Control Console

Controls and indicators of the missile radar control console (B, fig. 31) used by operating personnel are on the missile track indicator (fig. 36), the missile track control drawer, the missile track control power supply, the missile control-indicator group, and the range indicator. The controls and indicators of each of the above assemblies are described in *a* through *e* below.

a. Missile Track Indicator. Controls and indicators of the missile track indicator (fig. 36) are shown on figure 103 and described in the associated legend.

b. Missile Track Control Drawer. The controls and indicators of the missile track control drawer (fig. 36) are shown on figure 104 and described in the associated legend.

c. Missile Track Control Power Supply. Controls and indicators of the missile track control power supply (fig. 36) are shown on figure 105 and described in the associated legend.

d. Missile Control-Indicator Group. Controls and indicators of the missile control-indicator group (fig. 36) are shown on figure 106 and described in the associated legend.

e. Range Indicator. The controls and indicators of the range indicator (fig. 36) on the missile radar control console are shown on figure 107 and described in the associated legend.

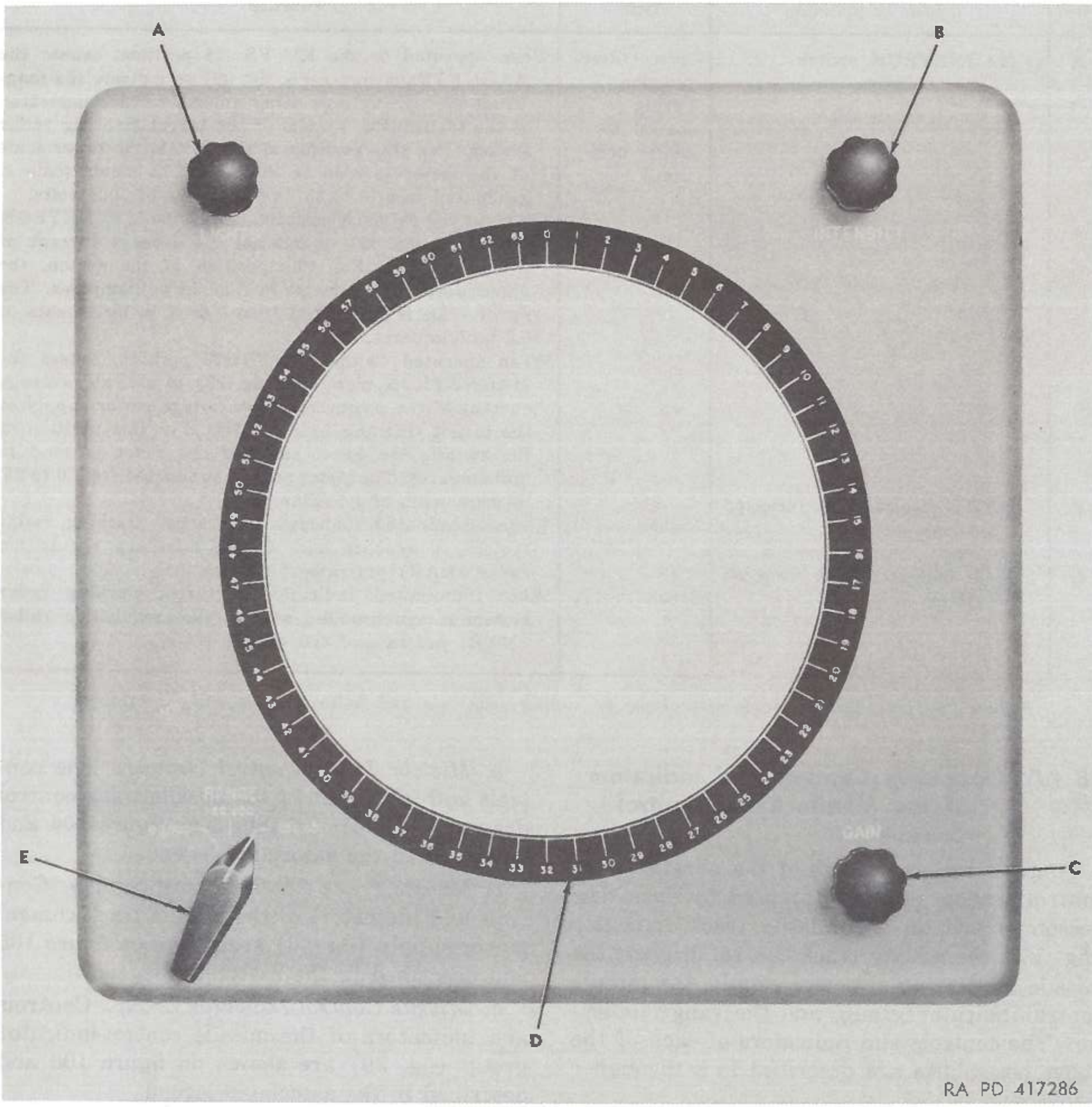


Figure 100. PPI (target radar control console)—controls and indicators.

Key to fig. 100	Control or indicator	Type	Function
A	LIGHTS knob	Rotary	When turned, adjusts the illumination of azimuth scale (D, fig. 100) on the PPI (fig. 34).
B	INTENSITY knob	Rotary	When turned, adjusts the illumination of the rotating radial sweep (C, fig. 113), and the acquisition (flashing) azimuth line (E, fig. 113).
C	GAIN knob	Rotary	When turned, adjusts the intensity of all displays on the PPI (fig. 34) except the rotating radial sweep (C, fig. 113) and the acquisition (flashing) azimuth line.
D	Azimuth scale	Dial	Provides a means for determining the azimuth of any display appearing on the PPI (fig. 34). Scale is graduated from 0 to 6400 mils in increments of 100 mils.
E	RANGE switch	Rotary (three-position).	When set, displays on the PPI (fig. 34) only those targets and objects within the range as determined by the setting (60,000; 120,000; or 250,000 yards) of the switch.

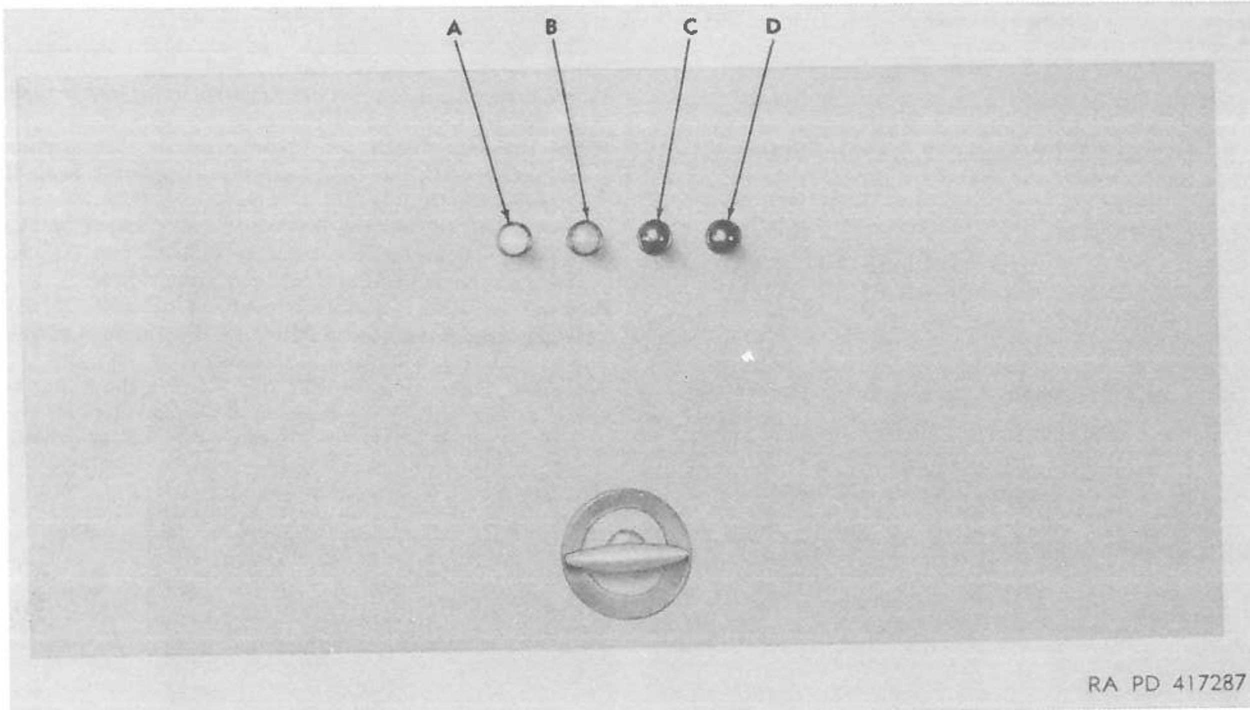


Figure 101. Target radar control console—partial view—upper center access door—indicator lights.

Key to fig. 101	Control or indicator	Type	Function
A	Equipment status indicator light.	White	When illuminated, indicates that white equipment status prevails.
B	Equipment status indicator light.	Yellow	When illuminated, indicates that yellow equipment status prevails.
C	Equipment status indicator light.	Blue	When illuminated, indicates that blue equipment status prevails.
D	Equipment status indicator light.	Red	When illuminated, indicates that red equipment status prevails.

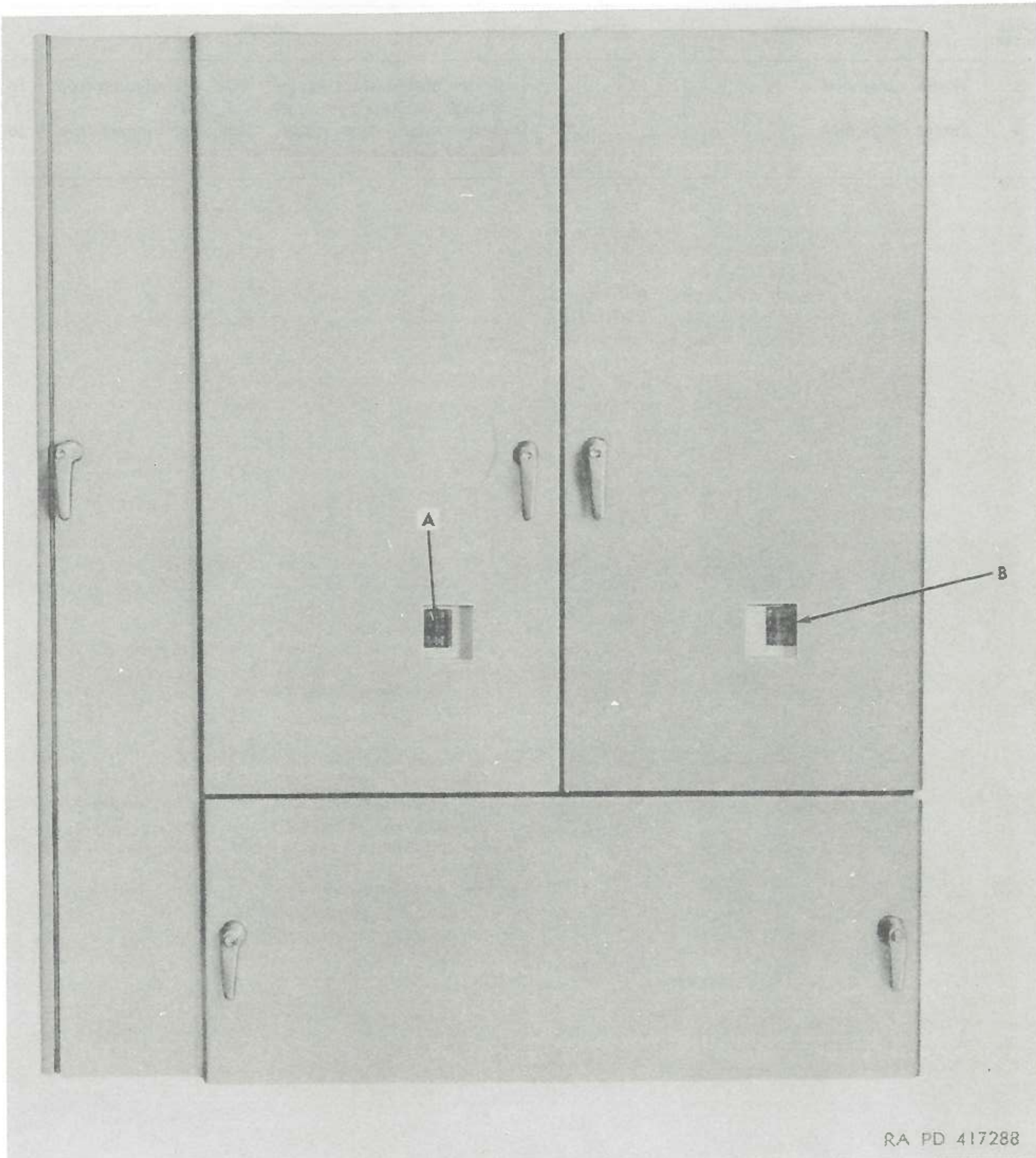


Figure 102. Radar set group—indicators.

Key to fig. 102	Control or indicator	Type	Function
A	Missile range dial		Indicates missile slant range. Dial is graduated from 0 to 200,000 yards in increments of 2 yards.
B	Target range dial		Indicates target slant range. Dial is graduated from 0 to 200,000 yards in increments of 2 yards.

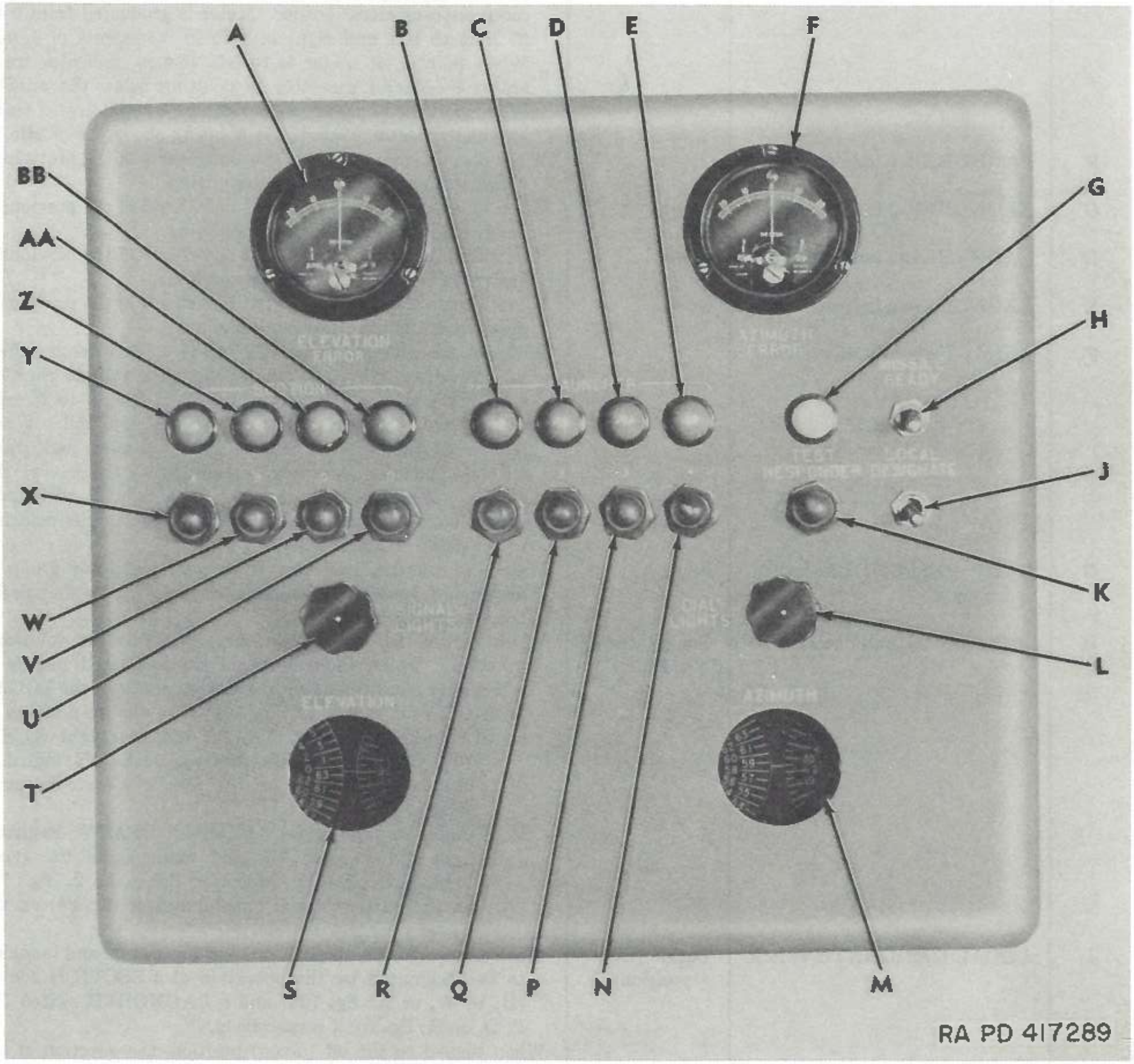


Figure 103 (CMHA). Missile track indicator—controls and indicators (systems 1186 and below).

Key	Control or indicator	Type	Function
A	ELEVATION ERROR meter		Indicates elevation pointing error of the track antenna reflector assembly (fig. 50) of the missile track antenna-receiver-transmitter group. Meter is graduated from 0 to 25 mils to left and right of zero in increments of 1 mil. When pointer of meter is to left of zero, indicates track antenna reflector assembly is pointing below the missile. When pointer of meter is to right of zero, indicates track antenna reflector assembly is pointing above the missile.
B	LAUNCHER-1 indicator light	Green	When illuminated, indicates that launcher 1 of the previously designated section has been designated.
C	LAUNCHER-2 indicator light	Green	When illuminated, indicates that launcher 2 of the previously designated section has been designated.
D	LAUNCHER-3 indicator light	Green	When illuminated, indicates that launcher 3 of the previously designated section has been designated.
E	LAUNCHER-4 indicator light	Green	When illuminated, indicates that launcher 4 of the previously designated section has been designated.
F	AZIMUTH ERROR meter		Indicates azimuth pointing error of the track antenna reflector assembly (fig. 50) of the missile track antenna-receiver transmitter group. Meter is graduated from 0 to 25 mils to left and right of zero in increments of 1 mil. When pointer of meter is to left of zero, indicates that track antenna reflector assembly is pointing to the left of the missile. When pointer of meter is to right of zero, indicates that the track antenna reflector assembly is pointing to the right of the missile.
G	TEST RESPONDER indicator light.	Ivory	When illuminated, indicates that flight simulator group is designated, instead of a missile, for tracking by the missile tracking radar system.
H	MISSILE READY switch	Toggle (two-position)	When turned to the up position, performs the following functions, which indicate that the designated missile is sufficiently conditioned to be tracked, provided the LOCAL DESIGNATE switch (J, fig. 103) is in the up position. *a.* Illuminates the green READY indicator light (D, fig. 106) and extinguishes the ivory READY indicator light (W, fig. 106) on the missile control-indicator group (fig. 36). *b.* Illuminates the green MISSILE-READY indicator light (M, 1, fig. 77) and extinguishes the ivory MISSILE-READY indicator light (F, 2, fig. 77) on the battery signal panel-indicator (fig. 24) on the battery control console.
J	LOCAL DESIGNATE switch	Toggle (two-position)	When turned to the up position, permits section and launcher to be designated by the operation of a SECTION switch (U, V, W, or X; fig. 103) and a LAUNCHER switch (N, P, Q, or R; fig. 103), respectively. When turned to the off (down) position, the selection of the section and launcher is transferred to the trailer mounted launching control station.

Figures 103 and 103.1 (U). Missile track indicator—controls and indicators—systems 1186 and below and 1187 and above—legend.

Key to figs. 103 and 103.1	Control or indicator	Type	Function
K	TEST RESPONDER switch	Pushbutton	When depressed, performs functions as listed in *a* through *e* below, provided LOCAL DESIGNATE switch (J, fig. 103) is turned to the up position: *a.* Illuminates TEST RESPONDER indicator light (G, fig. 103), indicating the flight simulator group is to be used with the missile-tracking radar system. *b.* Extinguishes the SECTION indicator light (Y, Z, AA, or BB, fig. 103) and the LAUNCHER indicator light (B, C, D, or E; fig. 103). *c.* Extinguishes green DESIGNATE indicator light (C, fig. 106), green READY indicator light (D, fig. 106), and green TRACK indicator light (E, fig. 106); and illuminates ivory DESIGNATE indicator light (X, fig. 106), ivory READY indicator light (W, fig. 106), and ivory TRACK indicator light (V, fig. 106) on the missile control-indicator group (fig. 36). *d.* Extinguishes the green MISSILE-DESIGNATED indicator light (L, 1, fig. 77), green MISSILE-READY indicator light (M, 1, fig. 77), and green MISSILE-TRACKED indicator light (N, 1, fig. 77); illuminates ivory MISSILE-DESIGNATED indicator light (E, 2, fig. 77), ivory MISSILE-READY indicator light (F, 2, fig. 77), and ivory MISSILE-TRACKED indicator light (G, 2, fig. 77) on the battery signal panel-indicator (fig. 24) on the battery control console. *e.* Causes the missile tracking radar system to automatically acquire and track flight simulator group provided TEST switch (A, fig. 104) is in down position.
L	DIAL LIGHTS knob	Rotary	When turned, adjusts the illumination of AZIMUTH dial (M, fig. 103) and ELEVATION dial (S, fig. 103); and the range dial (D, fig. 107) on the range indicator (fig. 36) on the missile radar control console.
M	AZIMUTH dial		Indicates the azimuth angle of the track antenna reflector assembly (fig. 50) of the missile track antenna-receiver-transmitter group. The dial is graduated from 0 to 6400 mils in increments of 5 mils.
N	LAUNCHER-4 switch	Pushbutton	When depressed, designates launcher 4 of the previously selected section, and illuminates LAUNCHER-4 indicator light (E, fig. 103) provided LOCAL DESIGNATE switch (J, fig. 103) is turned to the up position.
P	LAUNCHER-3 switch	Pushbutton	When depressed, designates launcher 3 of the previously selected section, and illuminates LAUNCHER-3 indicator light (D, fig. 103), provided LOCAL DESIGNATE switch (J, fig. 103) is turned to the up position.

Key to Figs. 103 and 103.1	Control or indicator	Type	Function
Q	LAUNCHER-2 switch	Pushbutton	When depressed, designates launcher 2 of the previously selected section, and illuminates LAUNCHER-2 indicator light (C, fig. 103) provided LOCAL DESIGNATE switch (J, fig. 103) is turned to the up position.
R	LAUNCHER-1 switch	Pushbutton	When depressed, designates launcher 1 of the previously selected section, and illuminates LAUNCHER-1 indicator light (B, fig. 103), provided LOCAL DESIGNATE switch (J, fig. 103) is turned to the up position.
S	ELEVATION dial		Indicates the elevation angle of the track antenna reflector assembly (fig. 50) of the missile track antenna-receiver-transmitter group. The dial is graduated from 0 to 6400 mils in increments of 5 mils.
T	SIGNAL LIGHTS knob	Rotary	When turned, adjusts the brilliance of all illuminated indicator lights on the missile track indicator (fig. 36). Adjusts the brilliance of all indicator lights on the missile control-indicator group (fig. 36) except the RECEIVER TEST indicator light (M, fig. 106).
U	SECTION-D switch	Pushbutton	When depressed, designates launching section D and illuminates SECTION-D indicator light (BB, fig. 103), provided LOCAL DESIGNATE switch (J, fig. 103) is turned to the up position.
V	SECTION-C switch	Pushbutton	When depressed, designates launching section C and illuminates SECTION-C indicator light (AA, fig. 103), provided LOCAL DESIGNATE switch (J, fig. 103) is turned to the up position.
W	SECTION-B switch	Pushbutton	When depressed, designates launching section B and illuminates SECTION-B indicator light (Z, fig. 103), provided LOCAL DESIGNATE switch (J, fig. 103) is turned to the up position.
X	SECTION-A switch	Pushbutton	When depressed, designates launching section A and illuminates SECTION-A indicator light (Y, fig. 103), provided LOCAL DESIGNATE switch (J, fig. 103) is turned to the up position.
Y	SECTION-A indicator light	Green	When illuminated, indicates that launching section A has been designated.
Z	SECTION-B indicator light	Green	When illuminated, indicates that launching section B has been designated.
AA	SECTION-C indicator light	Green	When illuminated, indicates that launching section C has been designated.
BB	SECTION-D indicator light	Green	When illuminated, indicates that launching section D has been designated.

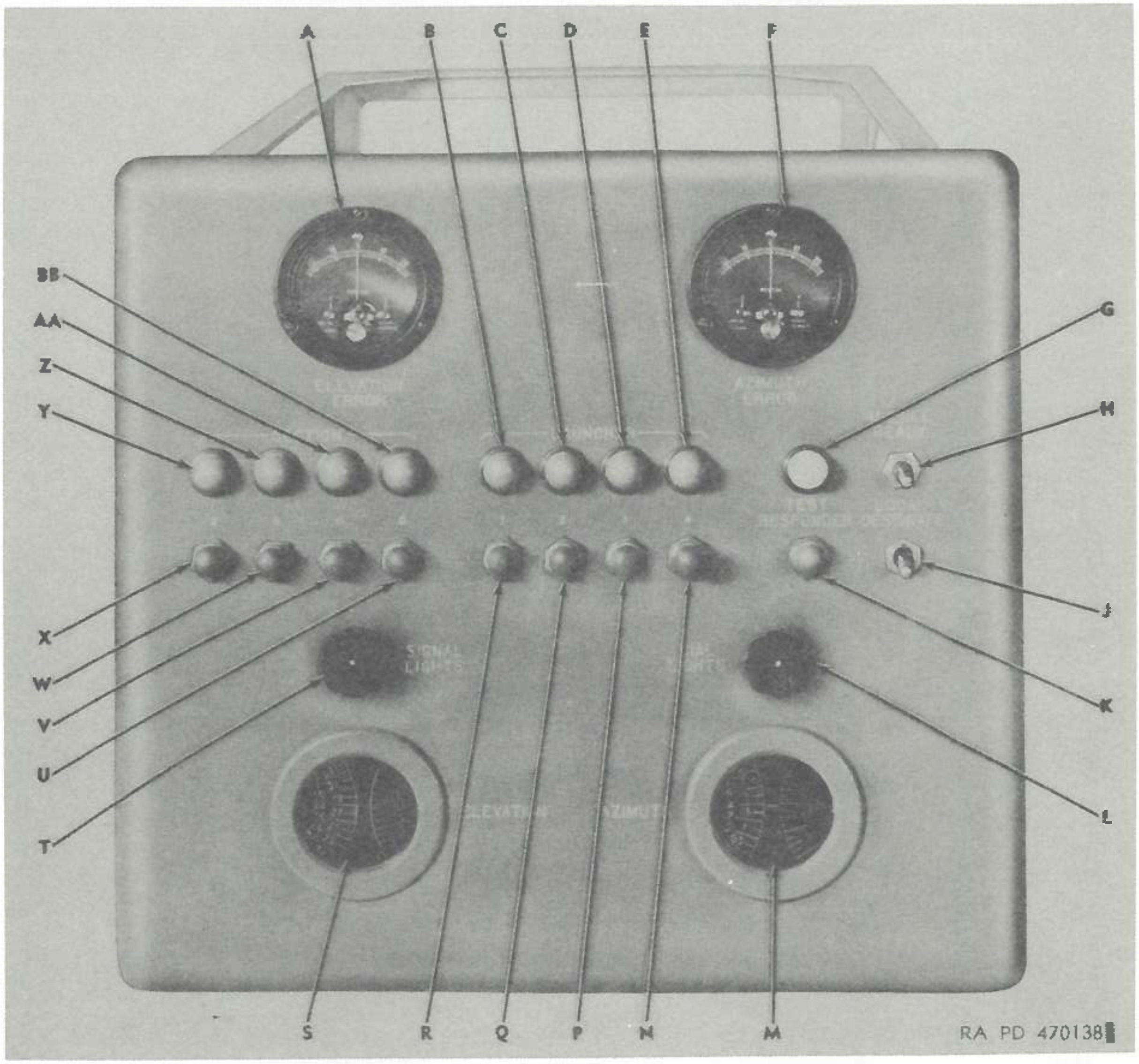


Figure 103.1. Missile track indicator - controls and indicators - systems 1187 and above.

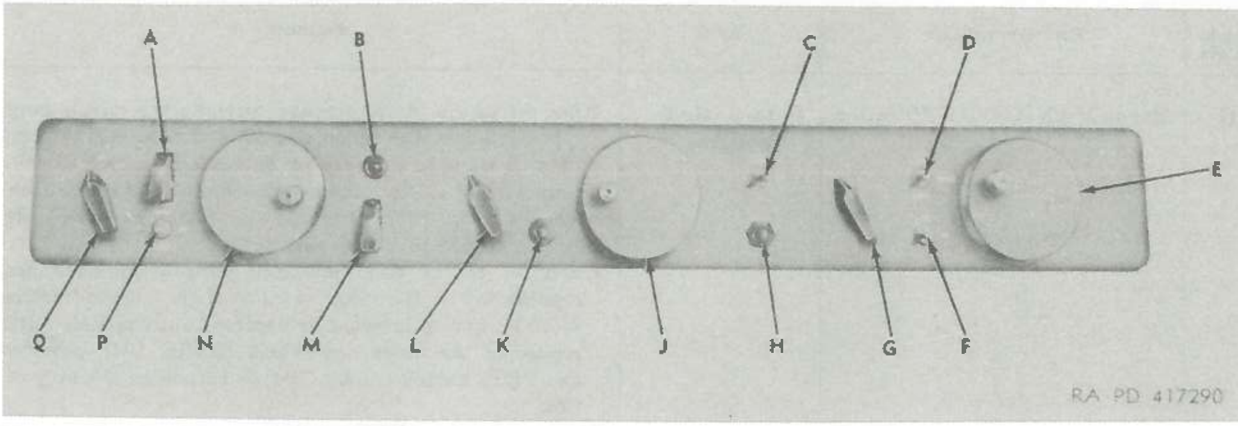


Figure 104. Missile track control drawer—controls and indicators.

Key to fig. 104	Control or indicator	Type	Function
A	TEST switch	Toggle (two-position, with guard).	When turned to the up position, places the missile-tracking radar system in the test condition. When turned to the down position, places missile-tracking radar system in automatic mode of operation.
B	COAST indicator light	Red	When illuminated, indicates that a received signal is not within the 100-yard range notch (fig. 123) of the range indicator (fig. 36) on the missile radar control console.
C	LAUNCHER ACQUIRE switch	Toggle (two-position, spring-loaded).	When operated to right position and held, automatically slews the elevation, azimuth and range circuits of the missile-tracking radar system to the elevation, azimuth and range of the designated missile or to missile flight simulator group.
D	RANGE switch	Toggle (three-position).	When set to the ZERO position, permits zeroing of the range circuits of the missile-tracking radar system. When set to the CALIBRATE position, permits calibration of the range circuits of the missile-tracking radar system. When set to the NORMAL position, permits normal operation of the range circuits of the missile-tracking radar system.
E	Range handwheel	Rotary	When rotated, causes the missile range, represented by the range circuits of the missile-tracking radar system, to increase or decrease, provided the range MAN-AID-AUTO switch (G, fig. 104) is set to either the MAN or the AID position, and the TEST switch (A, fig. 104) is turned to the up position.
F	Range SLEW switch	Toggle (three-position, spring-loaded to center position).	When operated, causes the range circuits of the missile tracking radar system to slew in or out in range at a more rapid rate than is provided by rotating the range handwheel (E, fig. 104).

Key to fig. 104	Control or indicator	Type	Function
G	Range MAN-AID-AUTO switch	Rotary (three-position).	When set to the MAN position, permits the missile range represented by the range circuits of the missile tracking radar system to increase or decrease at a rate directly proportional to the manual rotation of the range handwheel (E, fig. 104), provided the TEST switch (A, fig. 104) is turned to the up position. When set to the AID position, permits missile range, represented by the range circuits of the missile-tracking radar system to increase or decrease automatically after release of the range handwheel (E, fig. 104), provided the TEST switch (A, fig. 104) is turned to the up position. When set to the AUTO position, causes the missile range represented by the range circuits of the missile-tracking radar system to automatically remain the same as the range of the object being tracked, provided the TEST switch (A, fig. 104) is turned to the up position.
H	TRACKED switch	Pushbutton	When depressed, performs the following functions which indicate that the missile is being tracked in all three coordinates: *a.* Illuminates green TRACK indicator light (E, fig. 106) and extinguishes ivory TRACK indicator light (V, fig. 106) on the missile control-indicator group (fig. 36) on the missile radar control console. *b.* Illuminates green MISSILE-TRACKED indicator light (N, 1, fig. 77) and extinguishes ivory MISSILE-TRACKED indicator light (G, 2, fig. 77) on the battery signal panel-indicator (fig. 24) on the battery-control console.
J	Azimuth handwheel	Rotary	When rotated, positions the track antenna reflector assembly (fig. 50), associated with the missile-tracking radar system, in azimuth, provided the azimuth MAN-AID-AUTO switch (L, fig. 104) is set to either the MAN or the AID position, and the TEST switch (A, fig. 104) is turned to the up position.
K	REJECT switch	Pushbutton	When depressed, performs the following functions, provided no fire order has been issued: *a.* Causes the missile-tracking radar system to abandon the missile it is tracking and to acquire the next designated missile. *b.* Extinguishes green READY indicator light (D, fig. 106) and green TRACK indicator light (E, fig. 106); and illuminates ivory READY indicator light (W, fig. 106) and ivory TRACK indicator light (V, fig. 106) on the missile control-indicator group (fig. 36).

Key to fig. 104	Control or indicator	Type	Function
			c. Extinguishes green MISSILE-READY indicator light (M, 1, fig. 77) and green MISSILE-TRACKED indicator light (N, 1, fig. 77); and illuminates ivory MISSILE-READY indicator light (F, 2, fig. 77) and ivory MISSILE-TRACKED indicator light (G, 2, fig. 77) on the battery signal panel-indicator (fig. 24) on the battery-control console.
L	Azimuth MAN-AID-AUTO switch.	Rotary (three-position).	When set to the MAN position, causes the track antenna reflector assembly (fig. 50) associated with the missile-tracking radar system to be positioned in azimuth at a rate directly proportional to the manual rotation of the azimuth handwheel (J, fig. 104), provided the TEST switch (A, fig. 104) is turned to the up position. When set to the AID position, causes the track antenna reflector assembly (fig. 50) associated with the missile-tracking radar system to continue to move in azimuth automatically after release of the azimuth handwheel (J, fig. 104), provided the TEST switch (A, fig. 104) is turned to the down position. The rate and direction at which the track antenna reflector assembly moves remains the same as it was at the time the azimuth handwheel was released. When set to the AUTO position, causes the track antenna reflector assembly (fig. 50) associated with the missile-tracking radar system to be automatically positioned to the azimuth angle of the object being tracked.
M	DISABLE switch	Toggle (two-position, with guard).	When turned to the up position, removes the coast circuit from the missile-tracking radar system. When turned to the down position, enables the coast circuit of the missile-tracking radar system.
N	Elevation handwheel	Rotary	When rotated, positions the track antenna reflector assembly (fig. 50) associated with the missile-tracking radar system, in elevation, provided the elevation MAN-AID-AUTO switch (Q, fig. 104) is set to either the MAN or AID position, and the TEST switch (A, fig. 104) is turned to the up position.
P	SERVOS switch	Toggle (three-position).	When set to the NORMAL position, permits normal operation of the missile-tracking radar system. When set to the INC position, applies a constant automatic tracking rate to the azimuth, elevation, and range servos of the missile-tracking radar system for use during testing. This rate is in a positive direction. When set to the DEC position, applies a constant automatic tracking rate to the azimuth, elevation, and range servos of the missile-tracking radar system for use during testing. This rate is in a negative direction

Key to fig. 103	Control or indicator		Type	Function
Q	Elevation switch.	MAN-AID-AUTO	Rotary (three-position).	When set to the MAN position, causes the track antenna reflector assembly (fig. 50) associated with the missile-tracking radar system to be positioned in elevation at a rate directly proportional to the manual rotation of the elevation handwheel (N, fig. 104) provided the TEST switch (A, fig. 104) is turned to the up position. When set to the AID position, causes the track antenna reflector assembly (fig. 50) associated with the missile-tracking radar system, to continue to move in elevation automatically after release of the elevation handwheel (N, fig. 104), provided the TEST switch (A, fig. 104) is turned to the up position. The rate and direction at which the track antenna reflector assembly moves remains the same as it was at the time the elevation handwheel was released. When set to the AUTO position, causes the track antenna reflector assembly (fig. 50) associated with the missile-tracking radar system, to be automatically positioned to the elevation angle of the object being tracked.

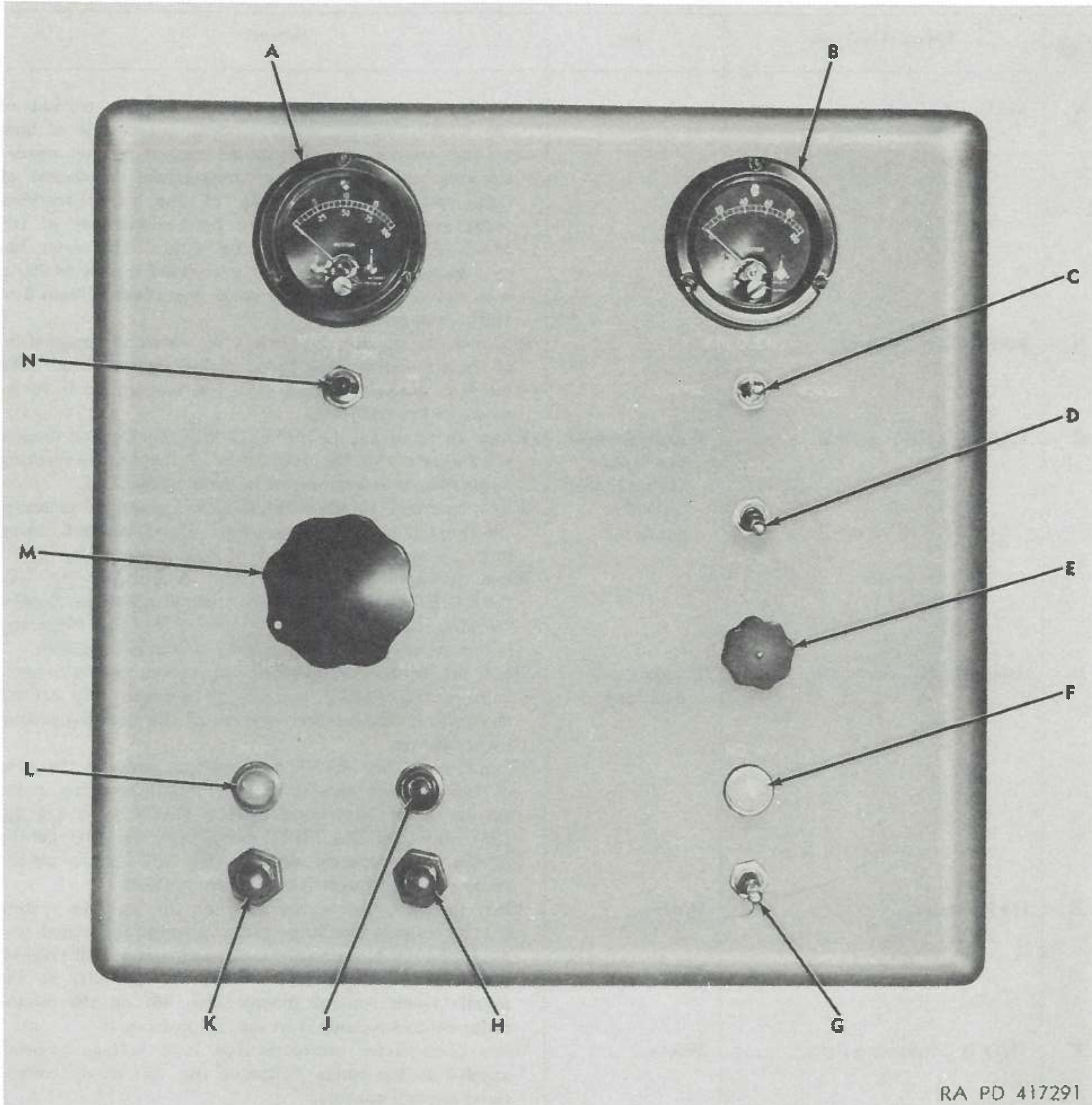


Figure 105. Missile track control power supply—controls and indicators.

Key to fig. 105	Control or indicator	Type	Function
A	MAGNETRON meter		Indicates magnitude of average magnetron current of the missile-tracking radar system, magnitude of high voltage applied to transmitter system of the missile-tracking radar system, or magnitude of current of high voltage power supply of the missile-tracking radar system as determined by the position of the MAGNETRON switch (N, fig. 105). The meter has two scales. The top scale is graduated from 0 to 20, in increments of 1; the lower scale is graduated from 0 to 100 in increments of 5.
B	FREQUENCY meter		Indicates the relative frequency at which the magnetron of the missile-tracking radar system is operating. The meter is graduated from 0 to 100 megacycles in increments of 5 megacycles.
C	FREQUENCY switch	Toggle (three-position, spring-loaded to center position).	When operated to the DECREASE position, decreases the frequency of the magnetron of the missile-tracking radar system to a minimum of 8500 megacycles. When operated to the INCREASE position, increases the frequency of the magnetron of the missile-tracking radar system to a maximum of 9600 megacycles. When released from either the INCREASE or DECREASE position, causes the magnetron of the missile-tracking radar system to operate at the frequency indicated on the FREQUENCY meter (B, fig. 105).
D	AGC-MANUAL switch	Toggle (two-position).	When set to the AGC position, causes the automatic gain control (AGC) circuits to automatically control the gain of the receiver system of the missile-tracking radar system. When set to the MANUAL position, permits the gain of the receiver system of the missile-tracking radar system to be controlled by the GAIN knob (E, fig. 105), provided the TEST switch (A, fig. 104) on the missile track control drawer (fig. 36) on the missile radar control console is in the up position.
E	GAIN knob	Rotary	When turned, adjusts the gain of the receiver system of the missile-tracking radar system, provided the AGC-MANUAL switch (D, fig. 105) is in the MANUAL position, and the TEST switch (A, fig. 104) on the missile track control drawer (fig. 36) on the missile radar control console is in the up position.
F	IND HV indicator light	White	When illuminated, indicates that high voltage is being applied to the range indicator (fig. 36) of the missile radar control console.
G	IND HV switch	Toggle (two-position).	When turned to the on (up) position, applies high voltage to the range indicator (fig. 36) on the missile radar control console, and illuminates IND HV indicator light (F, fig. 105).

Key to fig. 105	Control or indicator	Type	Function
H	HV SUPPLY-ON switch	Pushbutton	When depressed, applies high voltage to the transmitter system of the missile-tracking radar system. Illuminates HV SUPPLY-ON indicator light (J, fig. 105), and the MISSILE-HIGH VOLTS-ON indicator light (G, fig. 88) on the radar power control panel (fig. 33). Extinguishes the HV SUPPLY-READY indicator light (L, fig. 105), and extinguishes the following indicator lights on the radar power control panel: *a.* MISSILE-HIGH VOLTS-READY indicator light (H, fig. 88). *b.* MISSILE-HIGH VOLTS-HOT indicator light (J, fig. 88). *c.* MISSILE-HIGH VOLTS-PREHEAT indicator light (K, fig. 88). *d.* MISSILE-INTLK indicator light (P, fig. 88).
J	HV SUPPLY-ON indicator light.	Red	When illuminated, indicates that high voltage is being applied to the transmitter system of the missile-tracking radar system.
K	HV SUPPLY-OFF switch	Pushbutton	When depressed, removes high voltage from the transmitter system of the missile-tracking radar system. Extinguishes HV SUPPLY-ON indicator light (J, fig. 105), and the MISSILE-HIGH VOLTS-ON indicator light (G, fig. 88) on the radar power control panel (fig. 18). Illuminates the HV SUPPLY-READY indicator light (L, fig. 105) and illuminates the following indicator lights on the radar power control panel: *a.* MISSILE-HIGH VOLTS-READY indicator light (H, fig. 88). *b.* MISSILE-HIGH VOLTS-HOT indicator light (J, fig. 88). *c.* MISSILE-HIGH VOLTS-PREHEAT indicator light (K, fig. 88). *d.* MISSILE-INTLK indicator light (P, fig. 88).
L	HV SUPPLY-READY indicator light.	Green	When illuminated, indicates that high voltage may be applied to the transmitter system of the missile-tracking radar system.
M	HV SUPPLY knob	Rotary	When turned, adjusts high voltage applied to the transmitter system of the missile-tracking radar system, as indicated on the MAGNETRON meter (A, fig. 105). (Must be in START position, fully counterclockwise, before high voltage can be applied to the transmitter system.)

Key to fig. 105	Control or indicator	Type	Function
N	MAGNETRON switch	Lever (three-position, spring-loaded to center position).	When operated to the KV FS=20 position, causes the MAGNETRON meter (A, fig. 105) to indicate the magnitude of high voltage being applied to the magnetron of the transmitter system of the missile-tracking radar system. The magnitude is indicated on the upper scale of the meter. The scale is graduated from 0 to 20, representing 0 to 20,000 volts in increments of 1, representing 1000 volts. When set to the FS 20MA position, causes the MAGNETRON meter (A, fig. 105) to indicate the average current of the magnetron of the transmitter system of the missile-tracking radar system. Current is indicated in milliamperes on the top scale of the meter. Scale is graduated from 0 to 20 milliamperes in increments of 1 milliampere. When operated to MA FS=100 position, causes the MAGNETRON meter (A, fig. 105) to indicate average current of the magnetron high voltage power supply of the missile-tracking radar system. Current is indicated in milliamperes on the lower scale of the meter. Scale is graduated from 0 to 100 milliamperes in increments of 5 milliamperes.

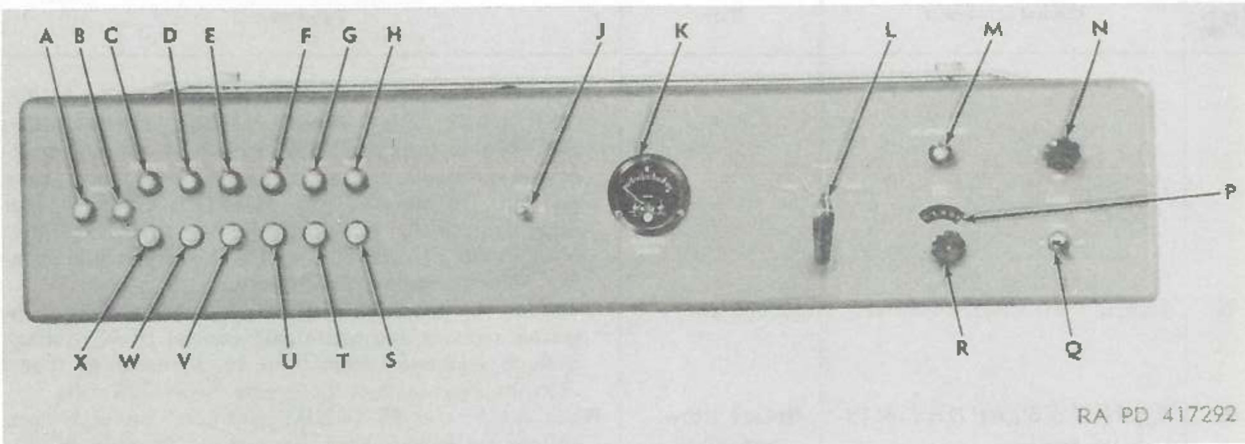


Figure 106. Missile control-indicator group—controls and indicators.

Key to fig. 106	Control or indicator	Type	Function
A	MISSILE-NIKE I indicator light.	Green	When illuminated, indicates that a NIKE-AJAX missile has been designated for the immediate engagement.
B	MISSILE-NIKE B indicator light.	Green	When illuminated, indicates that a NIKE-HERCULES missile has been designated for the immediate engagement.
C	DESIGNATE indicator light	Green	When illuminated, indicates that either the launcher and section from which the missile is to be fired, or the flight simulator group has been designated.
D	READY indicator light	Green	When illuminated, indicates a degree of readiness of the designated missile or the flight simulator group.
E	TRACK indicator light	Green	When illuminated, indicates that the designated missile is being tracked by the missile-tracking radar system.
F	FIRE indicator light	Green	When illuminated, indicates that the fire order has been issued.
G	LAUNCH indicator light	Green	When illuminated, indicates that the designated missile has been launched.
H	BURST indicator light	Green	When illuminated, indicates that the burst order has been issued.
J	TEST-I-B switch	Toggle (two-position).	When set to the I position, permits testing of the NIKE-AJAX coder circuits of the missile-tracking radar system, provided the TEST switch (A, fig. 104) on the missile track control drawer (fig. 36) is turned to the up position. Illuminates the MISSILE-NIKE I indicator light (A, fig. 106), provided the LOCAL DESIGNATE switch (J, fig. 103) on the missile track indicator (fig. 36) is turned to the up position.

Key to fig. 106	Control or indicator	Type	Function
			When set to the B position, permits testing of the NIKE-HERCULES coder circuits of the missile-tracking radar system, provided TEST switch (A, fig. 104) on the missile track control drawer (fig. 36) is turned to the up position. Illuminates the MISSILE-NIKE B indicator light (B, fig. 106) provided the LOCAL DESIGNATE switch (J, fig. 103) on the missile track indicator (fig. 36) is turned to the up position.
K	RECEIVED SIGNAL meter		Indicates the magnitude of the missile-tracking radar system receiver automatic gain control (AGC) voltage. Scale is graduated from 0 to 10, representing 0 to 5 volts, in increments of 0.5, representing 0.25 volts.
L	TARGET-STANDBY-MISSILE switch.	Rotary (three-position).	When set to the STANDBY position, makes filament voltage available to the radar test set TS-847A/MSW-1 (fig. 53). Extinguishes RECEIVER TEST indicator light (M, fig. 106) on the missile control-indicator group (fig. 36) and the RECEIVER TEST indicator light (A, fig. 95) on the target test control (fig. 34) on the target radar control console. When set to the MISSILE position, conditions the radar test set TS-847A/MSW-1 (fig. 53) for use in testing the missile-tracking radar system. Illuminates the RECEIVER TEST indicator light (M, fig. 106). When set to the TARGET position, conditions the radar test set TS-847A/MSW-1 (fig. 53) for use in testing the target-tracking radar system. Illuminates RECEIVER TEST indicator light (A, fig. 95) on the target test control (fig. 34) on the target radar control console.
M	RECEIVER TEST indicator light.	Red	When illuminated, indicates that the TARGET-STANDBY-MISSILE switch (L, fig. 106) is set to the MISSILE position. Also indicates that the radar test set TS-847A/MSW-1 (fig. 53) is conditioned for testing the receiver system of the missile-tracking radar system.
N	RANGE-TRIM knob	Rotary	When turned, permits fine adjustment of the simulated range of the radio frequency signal produced by the missile oscillator in the radar test set TS-847A/MSW-1.
P	SIGNAL LEVEL dial		Indicates the attenuation of the transmitted signal from the missile oscillator of the radar test set TS-847A/MSW-1 (fig. 53). The dial is graduated from 0 to 35 db in increments of 1 db.
Q	RANGE-SLEW switch	Toggle (three-position, spring-loaded to center position).	When operated to the out (right) position, increases the simulated range of the radio frequency signal produced by the missile oscillator of the radar test set TS-847A/MSW-1 (fig. 53). When operated to the in (left) position, decreases the simulated range of the radio frequency signal produced by the missile oscillator of the radar test set TS-847A/MSW-1 (fig. 53).

Key to figs, 107 and 107.1	Control or indicator	Type	Function
			When released from either the left or right position to the center position, causes the simulated range of the radio frequency signal produced by the missile oscillator in the radar test set TS-847A/MSW-1 (fig. 53) to remain at the value indicated by the range dial (D, fig. 107) on the range indicator (fig. 36) of the missile radar control console, at the time the switch was released.
R	SIGNAL LEVEL knob	Rotary	When turned, adjusts the attenuation of the transmitted signal from the missile oscillator of the radar test set TS-847A/MSW-1 (fig. 53) as indicated by the SIGNAL LEVEL dial (P, fig. 106).
S	BURST indicator light	Ivory	When illuminated, indicates that no burst order has been issued.
T	LAUNCH indicator light	Ivory	When illuminated, indicates that no missile has been launched for the current engagement.
U	FIRE indicator light	Ivory	When illuminated, indicates that the fire order has not been issued.
V	TRACK indicator light	Ivory	When illuminated, indicates that neither a missile nor the flight simulator group is being tracked by the missile-tracking radar system.
W	READY indicator light	Ivory	When illuminated, indicates that neither the designated missile nor the flight simulator group is ready to be tracked.
X	DESIGNATE indicator light	Ivory	When illuminated, indicates that neither the launcher and section from which the missile is to be launched, nor the flight simulator group has been designated.

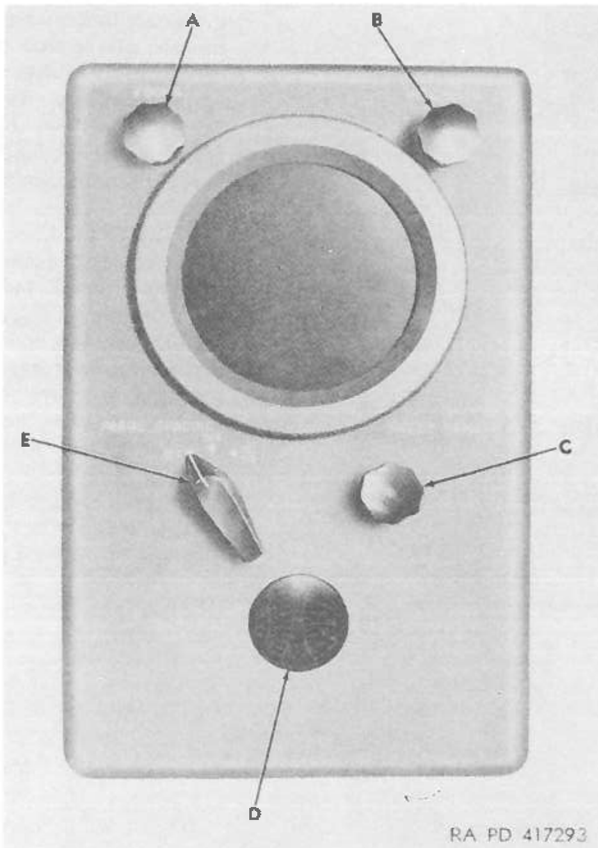


Figure 107. Range indicator (missile radar control console)—controls and indicators.
(Systems 1201 and below)

Key	Control or indicator	Type	Function
A	FOCUS knob	Rotary	When turned, adjusts the clearness and sharpness of the indicator presentation.
B	INTENSITY knob	Rotary	When turned adjusts the brightness of all displays shown on the face of the scope.
C	SWEEP LENGTH knob	Rotary	When turned, varies the range represented by the sweep (fig. 123) on the indicator presentation, from 40,000 yards to 200,000 yards for NIKE-HERCULES operation and from 10,000 yards to 55,000 yards for NIKE-AJAX operation.
D	Range dial		Indicates the missile range represented by the range circuits of the missile tracking radar system. The dial is graduated from 0 to 200,000 yards in increments of 10 yards.
E	IMAGE SPACING switch	Rotary (three-position)	When set to either the OFF or NOR position, a single base-line extends across the face of the cathode-ray tube as shown on figure 123. When set to the SEL SIG position, the presentation of the cathode-ray tube appears the same as when the switch is set to the OFF or NOR position, except the sweep on either side of the 500-yard expanded portion is not visible. This type presentation is shown on figure 122. *Note.* For a detailed explanation of the range indicator presentation with the IMAGE SPACING switch in each of its three positions, refer to paragraph 90*a*.

Figures 107 and 107.1 (CMHA). Range indicator (missile radar control console)—controls and indicators—systems 1201 and below and 1202 and above—legend.

Section III (U). DESCRIPTION OF CONTROLS AND INDICATORS OF THE ACQUISITION ANTENNA-RECEIVER-TRANSMITTER GROUP, THE MISSILE AND TARGET TRACK ANTENNA-RECEIVER-TRANSMITTER GROUPS, AND RADAR TEST SET TS-847A/MSW-1

79 (U). Controls and Indicators of the Acquisition Antenna-Receiver-Transmitter Group, Missile and Target Track Antenna-Receiver-Transmitter Groups

a. Acquisition Antenna-Receiver-Transmitter Group. Controls on the acquisition antenna-receiver-transmitter group (fig. 39) with which operating personnel are concerned are on the acquisition antenna pedestal (fig. 43) and that portion of interrogator set AN/TPX-27 and Mark X SIF/IFF equipment on the acquisition antenna. The SIF/IFF equipment installed at the acquisition antenna are the receiver-transmitter RT-211A/TPX (fig. 46), the coder-control unit KY-97B/TPX, and the recognition signal simulator SM-140/TPX. These controls are discussed in (1) and (2) below, respectively.

(1) Only one control on the acquisition antenna pedestal (fig. 43) is used by operating personnel. This control is shown on figure 108 and described in the associated legend.

(2) Controls for SIF/IFF equipment with which operating personnel should be familiar are shown on figure 109 and described in the associated legend.

b. Missile and Target Track Antenna-Receiver-Transmitter Groups. The controls on the missile track antenna-receiver-transmitter group (fig. 49) used by operating personnel are identical to the controls on the target track antenna-receiver-transmitter group (fig. 49) used by operating personnel. These controls are on the track antenna pedestal and the azimuth drive equipment enclosure, discussed in (1) and (2) below, respectively.

(1) The controls on the track antenna pedestal (fig. 50) are shown on figure 110 and described in the associated legend.

(2) The controls on the azimuth drive equipment enclosure (fig. 50) are shown on figure 111 and described in the associated legend.

80 (U). Controls and Indicators of Radar Test Set TS-847A/MSW-1

Controls and indicators of the radar test set TS-847A/MSW-1 (fig. 53) used by operating personnel are on the TARGET OSCILLATOR, test set monitor indicator panel, RF power meter, and MISSILE OSCILLATOR. These controls are shown on figure 112 and described in the associated legend.

Key	Control or indicator	Type	Function
A	Antenna disable switch	Toggle (two-position)	When set to ON enables the acquisition antenna azimuth drive motors. When set to OFF, disables the acquisition antenna azimuth drive motors.

Figure 108 (U). Acquisition antenna-receiver-transmitter group—partial view—control on acquisition antenna pedestal—legend.

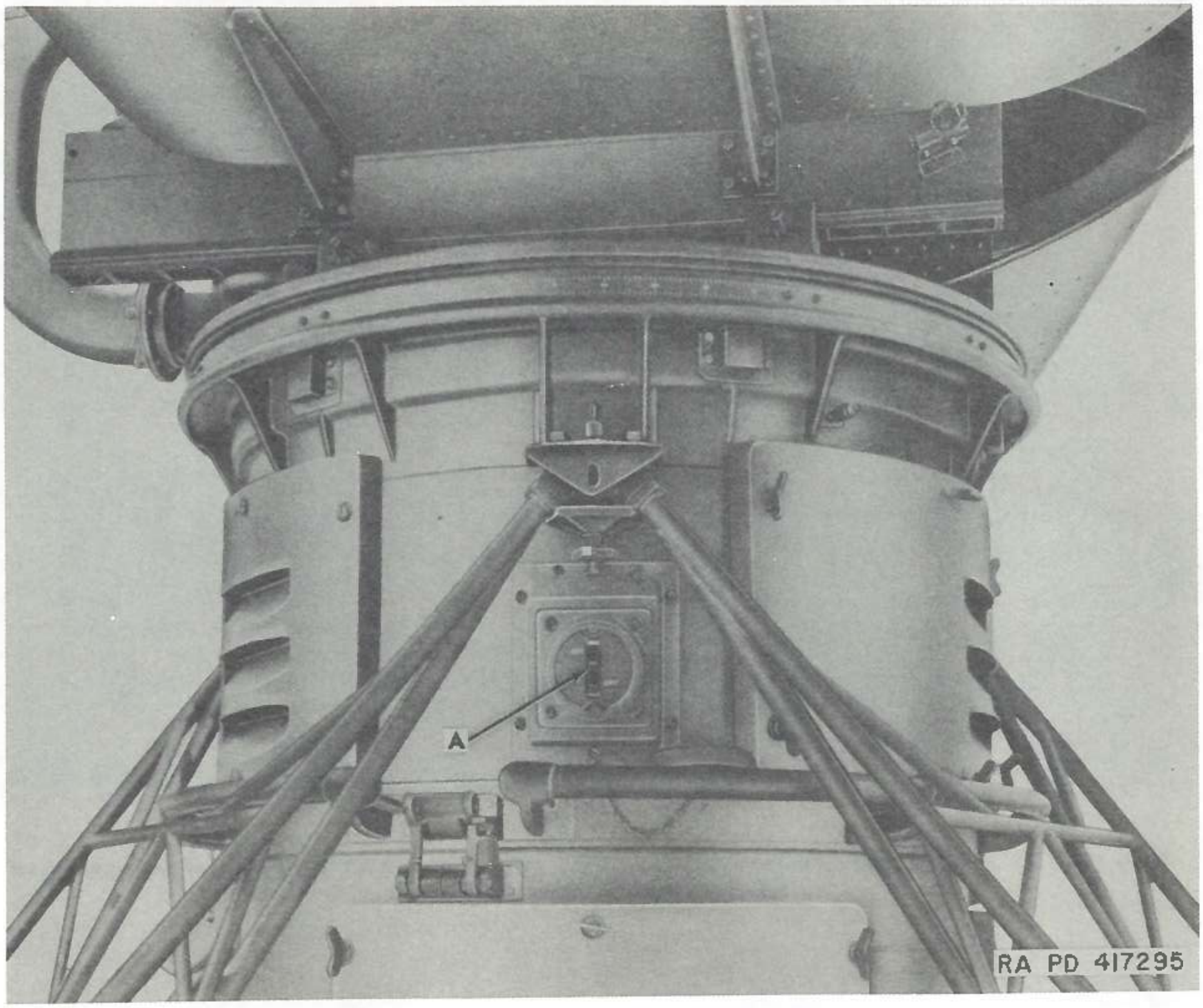


Figure 108 (U). Acquisition antenna-receiver-transmitter group—partial view—control on acquisition antenna pedestal.

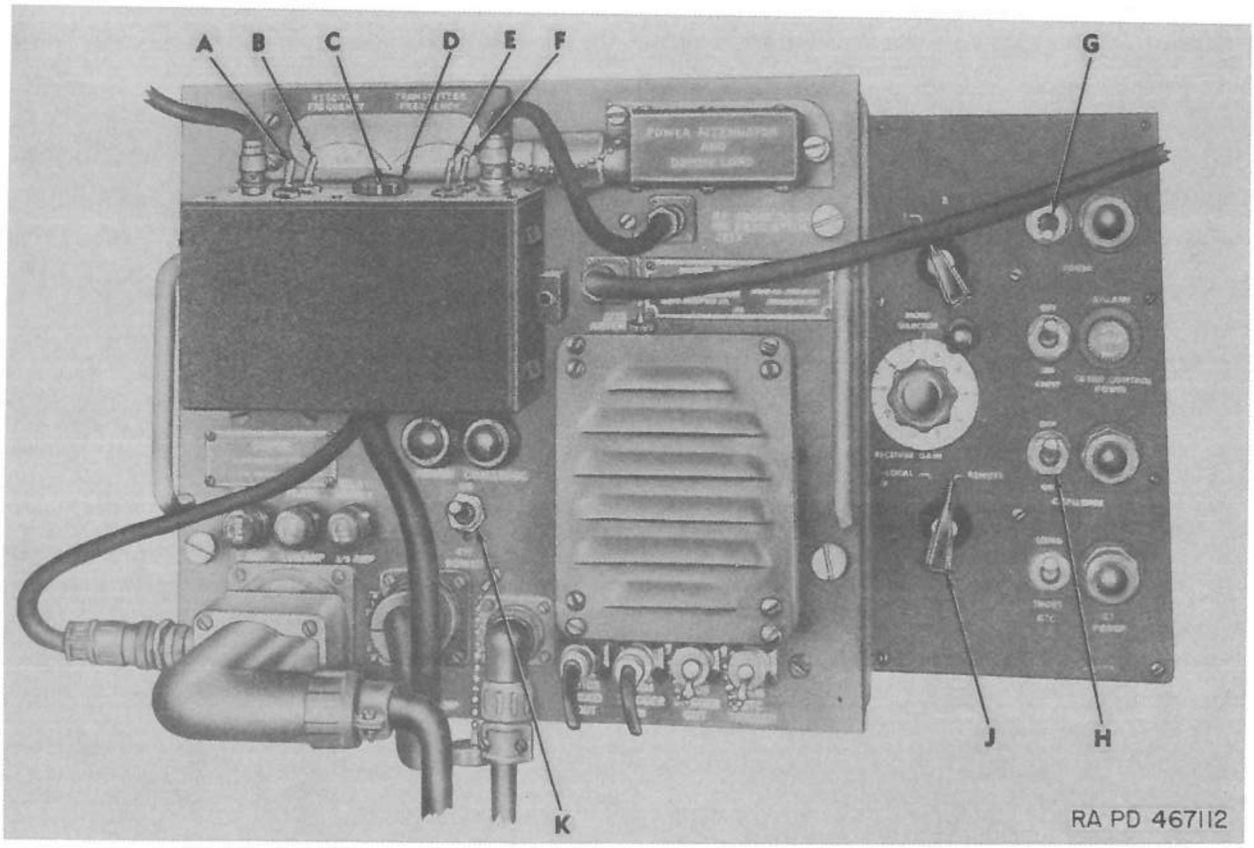


Figure 109 (U). SIF/IFF receiver-transmitter RT-211A/TPX, coder-control unit KY-97B/TPX, and recognition signal simulator SM-140/TPX—controls—partial.

Key	Control or indicator	Type	Function
A	POWER—ON-OFF switch	Toggle (two-position)	When placed in the ON position applies 110-volt, 400-cycle ac power to recognition signal simulator SM-140/TPX.
B	TRIG IN—PULSE-MODE 2	Toggle (two-position)	When placed in MODE 2 position, conditions the simulator to be triggered by the MODE 2 output only from the coder control unit. When placed in the PULSE position, conditions the simulator for operation from any trigger pulse available.
C	OUTPUT—DELAY knob	Rotary	Adjusts the delay of the simulator output signal from 10 to 100 microseconds with respect to the input triggers.
D	OUTPUT—LEVEL knob	Rotary	Adjusts the rf output signal strength to a level suitable for the associated receiver.
E	B+ ON—LOCAL-REMOTE switch	Toggle (two-position)	When set to LOCAL position, B+ power is applied only during local operation. When set to REMOTE position, B+ power is applied whenever the CHOP switch on coder control or acquisition control-indicator is set to ON.
F	OUTPUT-PULSE-CODE switch	Toggle (two-position)	When set to PULSE position, conditions the simulator to transmit a single rf pulse suitable for receiver testing. When set to CODE position, conditions the simulator to transmit a code 77 rf signal to the receiver and video decoder for testing.
G	Coder control POWER switch	Toggle (two-position)	When set to the ON position, applies ac power to the IFF coder control (fig. 46).
H	CHALLENGE switch	Toggle (two-position)	When set to the ON position, initiates operation of interrogator set AN/TPX-27. When set to the OFF position, stops operation of interrogator set AN/TPX-27 or allows the challenge function of interrogator set AN/TPX-27 to be controlled remotely.
J	LOCAL-REMOTE switch	Rotary (two-position)	When set to the LOCAL position, permits operation of interrogator set AN/TPX-27 by the controls on the front panel of the IFF coder. When set to the REMOTE position, permits operation of interrogator set AN/TPX-27 by the IFF controls (fig. 82) on the acquisition control-indicator (fig. 24) of the battery control console.
K	POWER switch	Toggle (two-position)	When set to the ON position, applies ac power to the IFF receiver-transmitter (fig. 46).

Figure 109 (U). SIF/IFF receiver-transmitter RT-211A/TPX, coder control unit KY-97B/TPX, and recognition signal simulator SM-140/TPX—controls—partial—legend.

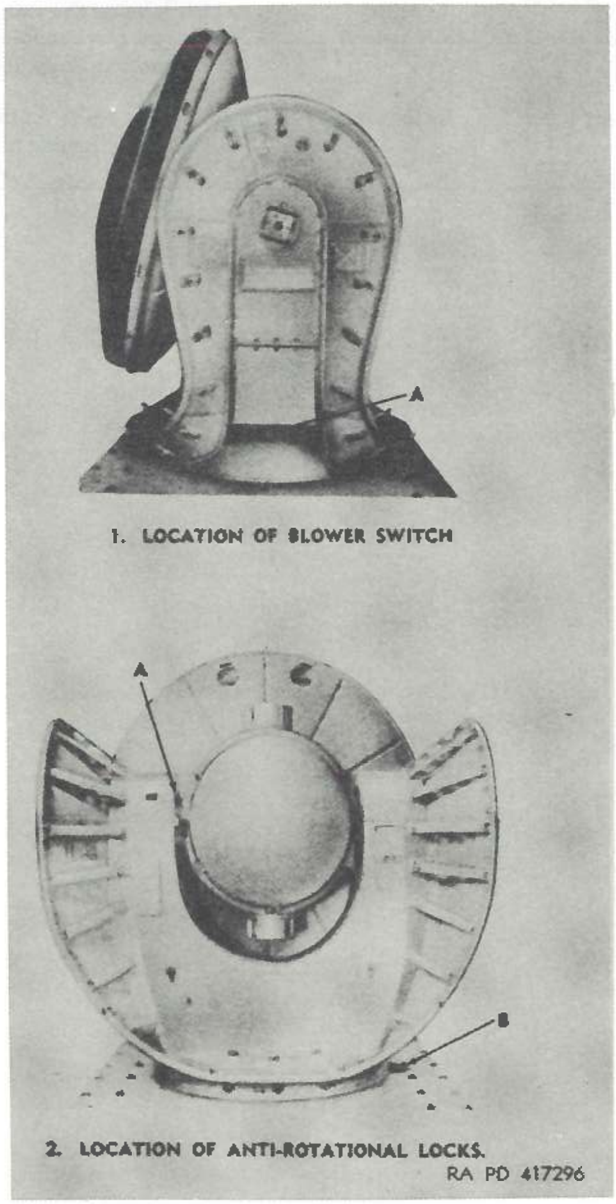


Figure 110. Missile or target track antenna-receiver-transmitter group—partial views—controls on track antenna pedestal.

Key to fig. 110	Control or indicator	Type	Function
A, 1	BLOWER switch	Toggle (two-position).	When set to the ON position, energizes the blower which inflates the radome.
A, 2	Elevation antirotational lock	Mechanical	Permits the track antenna reflector assembly (fig. 50) to be mechanically locked to prevent movement in elevation.
B, 2	Azimuth antirotational lock	Mechanical	Permits the track antenna pedestal (fig. 50) to be mechanically locked to prevent movement in azimuth.

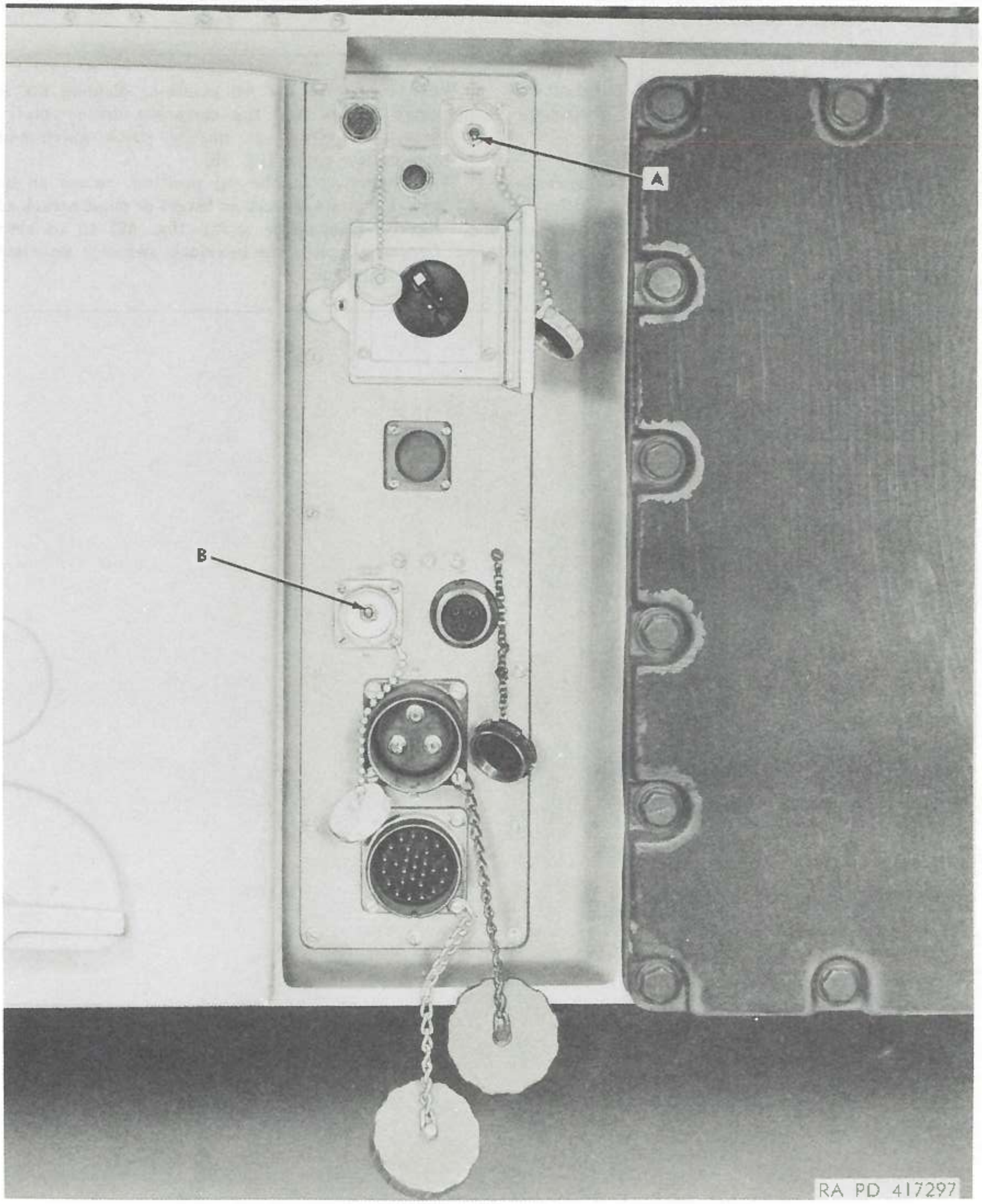


Figure 111. Azimuth drive equipment enclosure—partial view—controls.

Key to fig. 111	Control or indicator	Type	Function
A	ANTENNA DISABLE switch	Toggle (two-position).	When turned to the up position, disables the azimuth drive motors and the elevation drive motors of the associated target or missile track antenna-receiver-transmitter group (fig. 49).
B	INTERLOCK OVERRIDE switch.	Toggle (two-position, spring-loaded to up position, with cover).	When operated to the up position, causes all interlock switches on its associated target or missile track antenna-receiver-transmitter group (fig. 49) to be electrically bypassed, except the interlock switches associated with the magnetron.

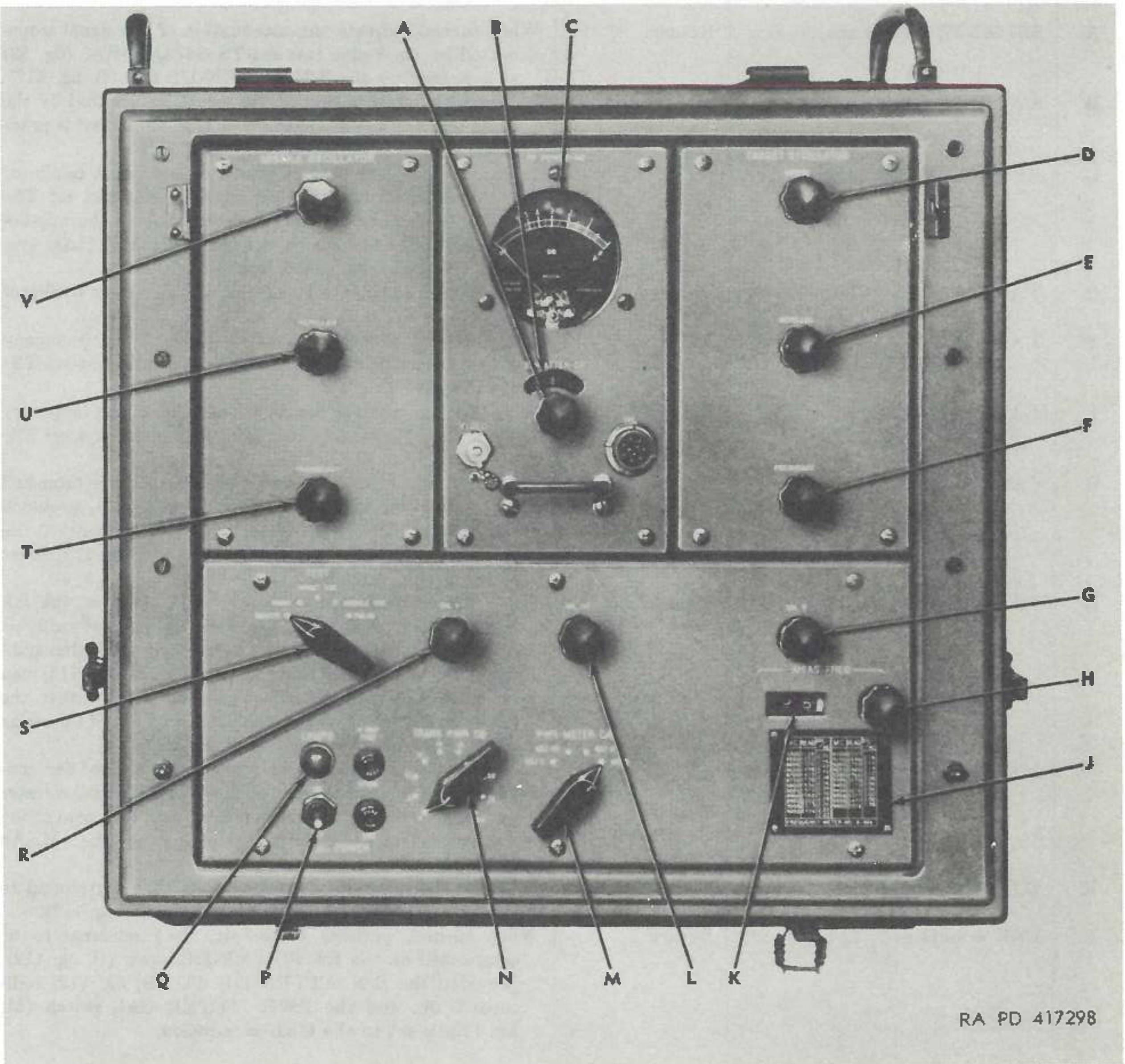


Figure 112. Radar test set TS-847A/MSW-1—controls and indicators.

Key to fig. 112	Control or indicator	Type	Function
A	S/N ATTEN-DB knob	Rotary	When turned, adjusts the attenuation of the signal transmitted by the radar test set TS–847A/MSW–1 (fig. 53) as indicated by the S/N ATTEN-DB dial (B, fig. 112).
B	S/N ATTEN-DB dial		Indicates the attenuation of the signal transmitted by the radar test set TS–847A/MSW–1 (fig. 53). Dial is graduated from 0 to 35 db in increments of 1 db.
C	RF POWER-DB meter		Indicates either the output power of the target oscillator or missile oscillator (fig. 53) of the radar test set TS–847A/MSW–1, or the power received from the missile-tracking radar system or the target-tracking radar system. Meter is graduated from ∞ to 0 db.
D	TARGET OSCILLATOR-OUTPUT knob.	Rotary	When turned, adjusts the output of the target oscillator (fig. 53) in the radar test set TS–847A/MSW–1.
E	TARGET OSCILLATOR-REPELLER knob.	Rotary	When turned, permits fine adjustment of the frequency of the target oscillator (fig. 53) in the radar test set TS–847A/MSW–1.
F	TARGET OSCILLATOR-FREQUENCY knob.	Rotary	When turned, permits coarse adjustment of the frequency of the target oscillator (fig. 53) in the radar test set TS–847A/MSW–1.
G	CAL 0 knob	Rotary	When turned, permits a zero reference to be established on the RF POWER-DB meter (C, fig. 112), provided the S/N ATTEN-DB dial (B, fig. 112) indicates 0 db, and the PWR METER CAL switch (M, fig. 112) is set to the CAL 0 position.
H	MEAS FREQ knob	Rotary	When turned sufficiently, causes the pointer of the RF POWER-DB meter (C, fig. 112) to move toward ∞. At maximum deflection of the pointer, the value indicated by the MEAS FREQ counter (K, fig. 112) can be converted into the frequency at which either the target oscillator or missile oscillator (fig. 53) of the radar test set TS–847A/MSW–1 is operating.
J	MEAS FREQ calibration chart		Serves as a conversion chart which may be used for converting readings appearing on the MEAS FREQ counter (K, fig. 112) into megacycles, or for converting megacycles into readings appearing on the MEAS FREQ counter.
K	MEAS FREQ counter		Indicates the number of counter units that correspond to the setting of the MEAS FREQ knob (H, fig. 112).
L	CAL ∞ knob	Rotary	When turned, permits an infinity (∞) reference to be established on the RF POWER-DB meter (C, fig. 112), provided the S/N ATTEN-DB dial (B, fig. 112) indicates 0 db, and the PWR METER CAL switch (M, fig. 112) is set to the CAL ∞ position.

Key to fig. 112	Control or indicator	Type	Function
M	PWR METER CAL switch	Rotary (four-position).	When set to the ADJ V position, permits calibration of the RF POWER-DB meter (C, fig. 112) by means of the CAL V knob (R, fig. 112). When set to the ADJ ∞ position, permits calibration of the RF POWER-DB meter (C, fig. 112) by means of the CAL ∞ knob (L, fig. 112). When set to the ADJ 0 position, permits calibration of the RF POWER-DB meter (C, fig. 112) by means of the CAL 0 knob (G, fig. 112). When set to the MEAS position, the RF POWER-DB meter (C, fig. 112) may be used for measuring the output power of the target oscillator or missile oscillator (fig. 53) of the radar test set TS-847A/MSW-1, or the power received from the missile-tracking radar system or the target-tracking radar system.
N	TRANS PWR-DB switch	Rotary (10-position).	When set, the value corresponding to the switch setting, plus the reading on RF POWER-DB meter (C, fig. 112) equals the db value of the signal being monitored.
P	AC POWER switch	Toggle (two-position).	When set to the ON position, energizes radar test set TS-847A/MSW-1 (fig. 53), or the power received from the missile-tracking radar system or the target-tracking radar system.
Q	LAMPS switch	Pushbutton	When depressed, illuminates the dial lights of the RF POWER-DB meter (C, fig. 112), S/N ATTEN-DB dial (B, fig. 112), and MEAS FREQ counter (K, fig. 112). When depressed a second time, extinguishes these same three dial lights.
R	CAL V knob	Rotary	When turned, permits a voltage reference to be established on the RF POWER-DB meter (C, fig. 112), provided the S/N ATTEN-DB dial (B, fig. 112) indicates 0 db, and the PWR METER CAL switch (M, fig. 112) is set to the ADJ V position.
S	TEST switch	Rotary (five-position).	When set, its position determines the type operation to be performed by the radar test set TS-847A/MSW-1 (fig. 53).
T	MISSILE OSCILLATOR-FREQUENCY knob.	Rotary	When turned, permits coarse adjustment of the frequency of the missile oscillator (fig. 53) in the radar test set TS-847A/MSW-1.
U	MISSILE OSCILLATOR-REPELLER knob.	Rotary	When turned, permits fine adjustment of the frequency of the missile oscillator (fig. 53) in the radar test set TS-847A/MSW-1.
V	MISSILE OSCILLATOR-OUTPUT knob.	Rotary	When turned, adjusts the output of the missile oscillator (fig. 53) in the radar test set TS-847A/MSW-1.

CHAPTER 5 (CMHA)

FUNCTIONAL OPERATIONS AND DESCRIPTION OF INDICATOR PRESENTATIONS OF THE RADAR COURSE DIRECTING CENTRAL

Section I (CMHA). RADAR, COMPUTING, AND PLOTTING EQUIPMENT

81 (U). Scope.

This section groups functionally related front panel controls and indicators of the radar, computing, and plotting equipment of the radar course directing central. Each functional group is separately discussed. This section also describes the cathode-ray tube presentations, the plotting board presentations, and certain meter and dial presentations, of the radar, computing, and plotting equipment. This section further explains how certain front panel controls are used to determine or vary the presentations.

82 (CMHA). Acquisition Radar Equipment Control

The operation of the acquisition radar system is controlled by operating various groups of controls, where each group is related to a control function. Each of the control functions is discussed separately in *a* through *d* below. Controls related to those systems with anti-jam display (AJD) capabilities are discussed in *e* below.

a. Antenna Control. Antenna control consists of the operations necessary to establish the desired azimuth rotational speed of the acquisition antenna (fig. 39) and the pointing angle of the acquisition antenna transmitted beam. The antenna disable switch (A, fig. 108) on the acquisition antenna pedestal (fig. 39), the ACQ MOTORS switch (A, fig. 71) on the rear of the acquisition power control panel (fig. 19), the ANTENNA-AZIMUTH RPM switch (M, fig. 82) the ANTENNA-ELEVATION scan switch (P, fig. 82), and the ANTENNA-ELEVATION indicator (N, fig. 82) on the acquisition control-indicator (fig. 24) are used in performing these operations.

(1) *Antenna disable switch and ATTENNA-AZIMUTH RPM switch.* The antenna disable switch (A, fig. 108) is a two-position (ON-OFF) toggle switch. When this switch is in the ON position, the azimuth rotational speed of the acquisition antenna is controlled by the ANTENNA-AZIMUTH RPM switch (M, fig. 82), provided the ACQ MOTORS switch (A, fig. 71) is in the ON position. The ACQ MOTORS switch is normally left in the ON position. When the antenna disable switch is in the OFF position, the acquisition antenna can only be manually rotated. The ANTENNA-AZIMUTH RPM switch is a four-position (OFF-5-10-15) switch. When this switch is in the OFF position, the acquisition antenna can only be manually located in azimuth. When the switch is in the 5, 10, or 15 position, the acquisition antenna rotates in azimuth at 5, 10, or 15 rpm, respectively.

(2) *ANTENNA-ELEVATION scan switch and ANTENNA-ELEVATION indicator.* The elevation angle of the acquisition antenna transmitted beam is controlled by the ANTENNA-ELEVATION scan switch (P, fig. 82) and indicated on the

ANTENNA-ELEVATION indicator (N, fig. 82). The ANTENNA-ELEVATION scan switch is a three-position (UP-center-DOWN/SCAN) switch, spring-loaded to the center position from the UP position. When this switch is operated to the UP position, the acquisition antenna transmitted beam increases in elevation until it reaches an angular position of 400 mils. The beam remains at this position until the ANTENNA-ELEVATION scan switch is set to the DOWN/SCAN position. When the switch is set to the DOWN/SCAN position the acquisition antenna transmitted beam decreases to a minimum of 0 mils. If the switch remains in the DOWN/SCAN position, the beam automatically scans between 35 mils and an upper limit determined by the prevailing scan condition. The prevailing scan condition determines the elevation at which the pencil-shaped transmitted beam changes to the cosecant squared beam. The adjustments for the scan condition are made at the acquisition antenna-receiver-transmitter group (fig. 39) in accordance with the procedures given in TM 9-1430-251-20. The four scan conditions are given in paragraph 61*a*. When the switch is released from the UP position, or set to the center from the DOWN/SCAN position, the acquisition antenna transmitted beam remains pointed in elevation the same as it was at the time the switch was released.

Note. The 0 mils referred to in this paragraph represents the lower limits of the transmitted beam.

b. Magnetron Frequency Control. Magnetron frequency control consists of the operations necessary to establish the desired operating frequency of the magnetron associated with the transmitter system of the acquisition radar system. The frequency switch (E, fig. 82), and the MAG FREQ & REC NOISE meter (G, fig. 82) on the acquisition control-indicator (fig. 24) are used in performing these operations. The frequency switch when operated to the DECREASE FREQ or the INCREASE FREQ position, decreases or increases, respectively, the frequency of the magnetron between 3100 and 3500 megacycles. When the frequency switch is released from either of these positions, the frequency remains as it was at the time the switch was released. The MAG FREQ & REC NOISE meter represents the relative frequency of the magnetron, provided the NOISE GEN switch (C, fig. 82) on the acquisition control-indicator is in the OFF position. The meter is graduated from 0 to 100 in increments of 5.

c. Automatic Frequency Control (AFC). Control of the intermediate frequency (IF) of the receiver system of the acquisition radar system is automatic; however, certain observations must be made by the operator to assure that the IF is correct. Also, certain operations must be performed by the operator to maintain the proper frequency in the event the IF is incorrect. These operations are discussed in (1) and (2) below. The AFC switch (E, fig. 82), the AFC-RELEASE switch (H, fig. 82), and the AFC-HUNT indicator light (D, fig. 82) are used to perform these operations:

(1) The AFC switch, when turned to the on (up) position, energizes the AFC circuits of the acquisition radar system. Normally, the AFC circuits automatically lock on the correct IF frequency (60 megacycles above the acquisition magnetron frequency). During normal operation, the AFC-HUNT indicator light (D, fig. 82) indicates the condition of the acquisition AFC circuit as explained in (*a*) through (*c*) below.

(*a*) A steady glow of the AFC-HUNT indicator light indicates that the acquisition AFC circuit is not locked on the correct IF, and that the AFC circuit is searching for the proper IF.

(*b*) An occasionally flickering or an extinguished AFC-HUNT indicator light accompanied by video on the PPI (fig. 24) on the battery-control console indicates that the acquisition AFC circuit is locked on the correct IF.

(*c*) A flickering AFC-HUNT indicator light, and reduced or no video on the PPI (fig. 24) on the battery-control console indicates that the AFC circuit is erroneously locked on a frequency of 60 megacycles below the acquisition magnetron frequency.

(2) If the AFC circuit locks on an incorrect frequency as explained in (1) (*c*) above, a search cycle can be started by depressing and holding for 5 seconds the AFC-RELEASE switch (H, fig. 82). This causes the AFC circuit to automatically search throughout its frequency range (3160 megacycles to 3560 megacycles). The AFC circuit then acquires and locks on the correct IF.

d. Acquisition High Voltage Control. Acquisition high voltage control consists of the observations that must be made and the operations that must be performed to apply high voltage to and remove high voltage from the precision indicator (fig. 24) and the PPI on the battery-control console, and the magnetron of the transmitter system of the acquisition radar system. The controls and indicator lights used in making the necessary observations and in performing the necessary operations are discussed in (1) and (2) below.

(1) *Indicator high voltage control.* When the IND HV switch (JJ, fig. 82) on the acquisition control-indicator (fig. 24) is turned to the on (up) position, high voltage is applied to the PPI and precision indicator on the battery-control console. This causes the cathode-ray tube of the precision indicator and the PPI to illuminate, provided the ANTENNA-AZIMUTH RPM switch (M, fig. 82) is set to either 5, 10, or 15 position, and the INTENSITY knob (B, fig. 80) on the PPI and the INTENSITY knob (A, fig. 81) on the precision indicator are properly adjusted, and also causes the IND HV-ON indicator light (KK, fig. 82) on the acquisition control-indicator (fig. 24) to illuminate.

(2) *Magnetron high voltage control.*

(*a*) When illuminated, the MAGNETRON-READY indicator light (PP, fig. 82) on the acquisition control-indicator (fig. 24) indicates that the necessary time delay has elapsed and that high voltage can be applied to the magnetron of the acquisition radar system, provided the MAGNETRON HV supply knob (QQ, fig. 82) is in the START position.

(*b*) If the MAGNETRON HV supply knob is in the START position, when the MAGNETRON-ON switch (LL, fig. 82) is depressed, the acquisition magnetron becomes energized, the MAGNETRON-ON indicator light (MM, fig. 82) illuminates, and the MAGNETRON-READY indicator light (PP, fig. 82) extinguishes. After the magnetron is energized, the current of the acquisition magnetron is controlled by the MAGNETRON HV supply knob. The MAGNETRON HV supply knob should be rotated smoothly clockwise until 30 to 33 milliamperes of current is indicated on the MAGNETRON meter (A, fig. 82). Arcing within the magnetron may cause the meter indication to be unstable for the first few seconds of operation. The MAGNETRON HV supply knob should be rotated until 30 milliamperes is indicated on the meter after indication has stabilized.

Caution: Do not force knob beyond the mechanical stops. If the meter needle continues to fluctuate after 5 to 10 seconds or the fluctuations are sufficient to actuate the overcurrent sensing device causing MAGNETRON-ON indicator light (MM, fig. 82) to extinguish, turn the knob counterclockwise and notify organizational maintenance technician.

Note. To read the average MAGNETRON switch (RR, fig. 82) must be in the center position (FS 50 MA).

(*c*) To deenergize the acquisition magnetron, the MAGNETRON HV supply knob is rotated counterclockwise to the START position and the MAGNETRON-OFF switch (NN, fig. 82) is depressed.

e. AJD control. AJD control consists of the operations necessary to ready the acquisition radar system for exposure to high levels of transmission jamming. The controls used for AJD control are the PROC switch (2, fig. 82.1), the AJD switch (4, fig. 82.1) and the JS ONLY switch (5, fig. 82.1).

(1) *PROC switch.* The PROC switch has three positions and is used by the operator to control the type of video applied to the acquisition presentation system, provided the AJD switch is set to the on (up) position. When set to the IS position, interference suppressor (IS) video is applied to the presentation system. When set to the OFF position, normal or MTI video is applied to the presentation system. When set to the on (up) position, MTI video is squelched and normal video is displayed on the presentation system.

(2) *AJD switch.* The AJD switch is used by the operator to control the video output of the auxiliary receiving channel. When the switch is set to the on (up) position, video from the main and auxiliary receiving channels is processed and applied to the presentation system. When set to the OFF position, the auxiliary receiving channel is disabled.

(3) *JS ONLY switch.* When the JS ONLY switch is set to the on (up) position jam strobe video only is applied to the presentation system. When set to the OFF position all video signals except jam strobe video is applied to the presentation system.

83 (CMHA). Description of Acquisition Radar Presentations

Note. This paragraph describes the PPI presentation excluding identification friend or foe (IFF) symbols and fire unit integration facility (FUIF) symbols. Coverage of the PPI presentation involving FUIF and IFF symbols is given in paragraphs 84 and 86, respectively.

a. PPI Presentation. During normal operation, prior to target detection, the basic PPI presentation (fig. 113) appears on the face of the cathode-ray tube (G, fig. 113) except that target video (B, fig. 113) is not present. Once a target is detected, target video (acquisition radar system return signals) becomes part of the basic presentation. Figure 113.1 shows a typical PPI presentation, when a NIKE-HERCULES system with anti-jam display (AJD) capabilities is used in an electronic counter-measure (ECM) environment. Reference marks and target video appearing on the cathode-ray tube are discussed in (1) below. The operational use of these reference marks and the controls affecting them are explained in (2) below. Differences pertaining to AJD that are reflected in figure 113.1 are discussed in (3) below.

Note. Key letters shown in parentheses in (1) below refer to figure 113 unless otherwise indicated.

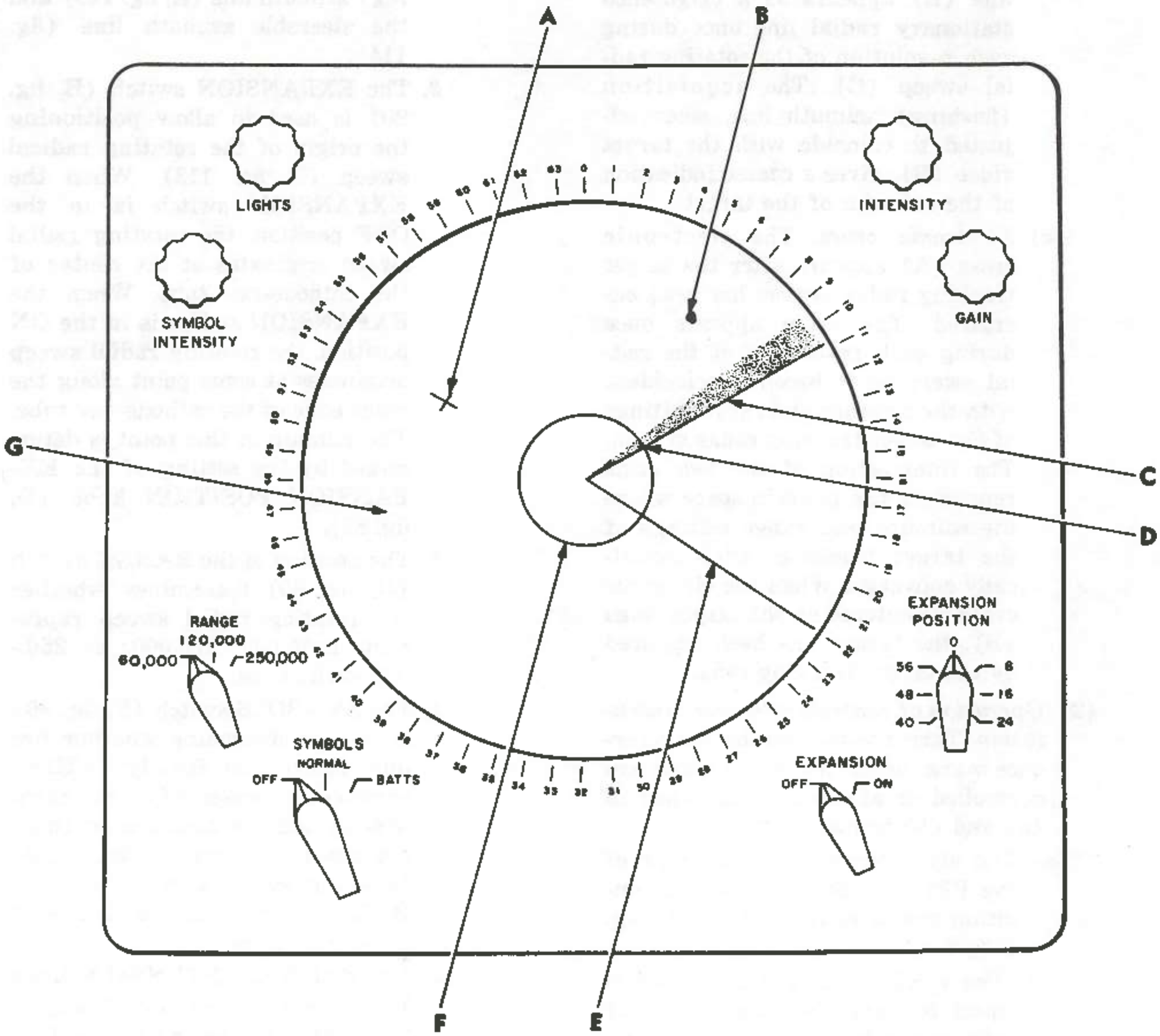
(1) *Basic presentation.* The basic PPI presentation on the face of the cathode-ray tube (G) consists of target video (B) when a target is present, and the following reference marks: rotating radial sweep (C), an acquisition range mark (D), an acquisition (flashing) azimuth line (E), and an electronic cross (A).

(*a*) *Rotating radial sweep.* The rotating radial sweep (C) extends from the center to the outer edge of the cathode-ray tube (G) provided the EXPANSION switch (E, fig. 80) is set to the OFF position. The EXPANSION switch is discussed in (2) (*a*)2 below. The sweep rotates clockwise around the face of the cathode-ray tube in synchronism with the rotation of the acquisition antenna (fig. 39). Once during each revolution the sweep brightens all displays on the cathode-ray tube as the sweep coincides with each display.

(*b*) *Target video.* Target video (B) becomes a part of the basic presentation when the acquisition radar system is operating and a target is detected. Target video appears as a bright dot with each rotation of the rotating radial sweep (C). The size of the dot depends upon the magnitude of the radar return signals from the target.

(*c*) *Acquisition range mark and acquisition range circle.* The acquisition range circle (F) appears as a result of the acquisition range mark (D). The acquisition range mark is superimposed on the rotating radial sweep (C). The acquisition range circle (F) is adjustable to represent a range from 0 to 250,000 yards. When the range circle is adjusted until it coincides with the target video (B), the position of the acquisition range circle represents the slant range of the target, as indicated by the RANGE dial (A, fig. 79) on the target designate control-indicator (fig. 24) on the battery-control console.

(*d*) *Acquisition (flashing) azimuth line.* The acquisition (flashing) azimuth



ORD G56495

A—Electronic cross
B—Target video
C—Rotating radial sweep
D—Acquisition range mark
E—Acquisition (flashing) azimuth line
F—Acquisition range circle
G—Cathode-ray tube

Figure 113 (CMHA). PPI—basic presentation.

line (E) appears as a brightened stationary radial line once during each revolution of the rotating radial sweep (C). The acquisition (flashing) azimuth line, when adjusted to coincide with the target video (B), gives a coarse indication of the azimuth of the target.

(e) *Electronic cross.* The electronic cross (A) appears after the target tracking radar system has been energized. The cross appears once during each revolution of the radial sweep as it becomes coincident with the azimuth and range settings of the target tracking radar system. The intersection of the two arms represents the point in space where the azimuth and range settings of the target tracking radar electrically converge. When the electronic cross is centered on the target video (B), the target has been acquired by the target tracking radar.

(2) *Operation of controls affecting presentation.* Target video and the five reference marks described in (1) above are controlled or affected as explained in (*a*) and (*b*) below.

(*a*) The eight controls on the front of the PPI (fig. 80) are used to condition the cathode-ray tube (G, fig. 113) for the desired presentations.

1. The LIGHTS knob (A, fig. 80) is used to vary the illumination of the azimuth scale (H, fig. 80). The INTENSITY knob (B, fig. 80) adjusts the intensity of all displays shown on the face of the PPI. The GAIN knob adjusts the intensity and resolution of all displays, except the rotating radial sweep (C, fig. 113), the acquisition (flashing) azimuth line (E, fig. 113) and the steerable azimuth line (fig. 114).

2. The EXPANSION switch (E, fig. 80) is used to allow positioning the origin of the rotating radical sweep (C, fig. 113). When the EXPANSION switch is in the OFF position, the rotating radial sweep originates at the center of the cathode-ray tube. When the EXPANSION switch is in the ON position, the rotating radial sweep originates at some point along the outer edge of the cathode-ray tube. The azimuth of this point is determined by the setting of the EXPANSION POSITION knob (D, fig. 80).

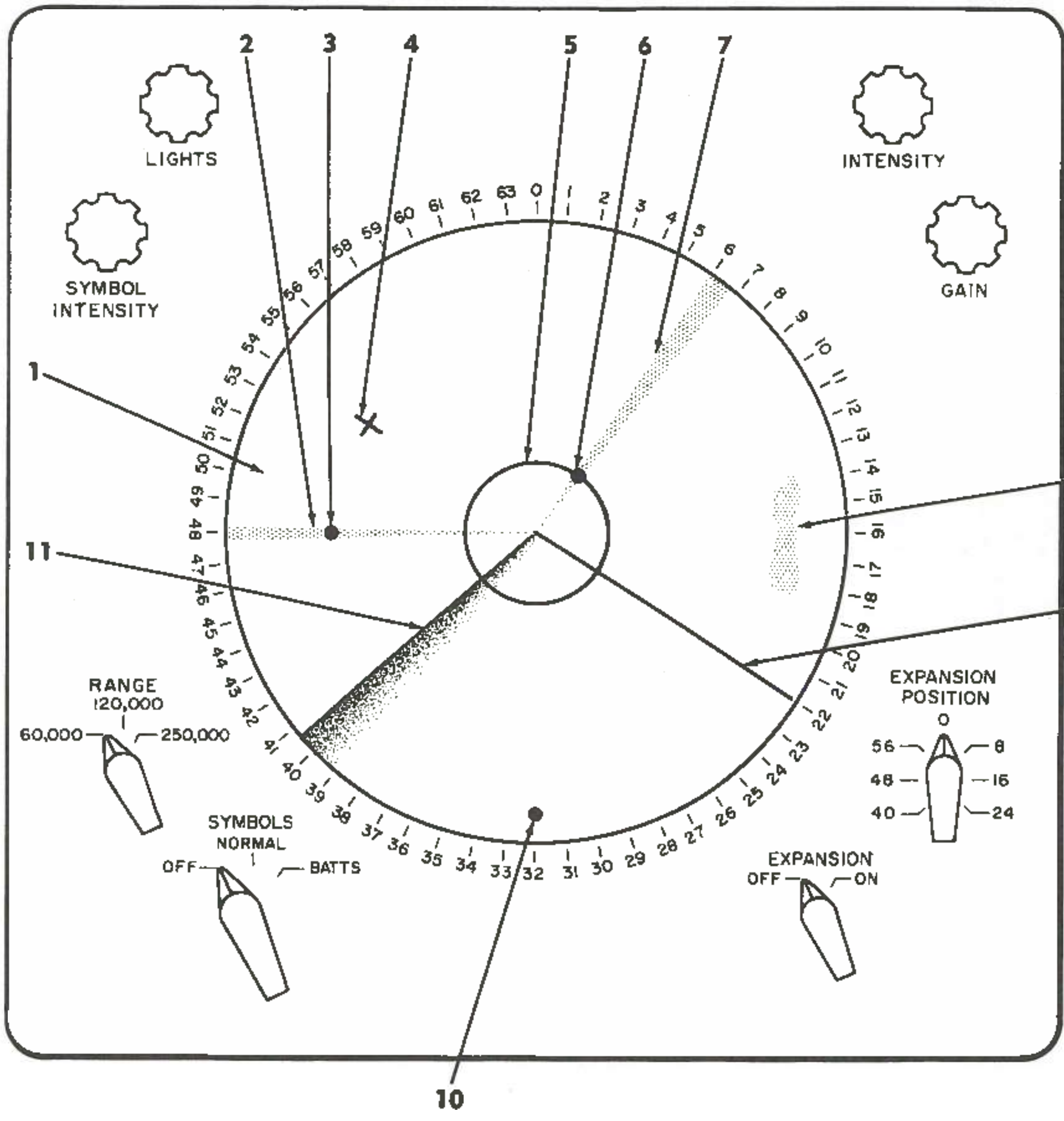
3. The position of the RANGE switch (G, fig. 80) determines whether the rotating radial sweep represents a 60,000; 120,000; or 250,000-yard range.

4. The SYMBOLS switch (F, fig. 80) is used to determine whether fire unit integration facility (FUIF) symbols are presented on the cathode-ray tube in addition to those explained as part of the basic presentation in *a* above. The SYMBOLS switch is further discussed in paragraph 84.

5. The SYMBOL INTENSITY knob (J, fig. 80) is used only to adjust the brilliance of the FUIF and IFF symbols displayed on the PPI.

(*b*) Controls used to modify the PPI presentation after the presentation is conditioned as explained in (*a*) above are discussed in *1* through *4* below.

1. Range handwheel, range SLEW



ORD G83294

1—Cathode-ray tube
2—Jam strobe no. 1
3—Jamming target no. 1 video
4—Electronic cross
5—Acquisition range circle
6—Jamming target no. 2 video
7—Jam strobe no. 2
8—Rotating radial sweep
9—Ground clutter video
10—Acquisition (flashing) azimuth line
11—Non-jamming target video

Figure 113.1 (CMHA). PPI—basic presentation of NIKE-HERCULES systems with anti-jam display capabilities.

switch, range MAN–AID switch, and RANGE dial. The acquisition range circle (F, fig. 113) provides a means of determining the slant range of the target designated by the acquisition radar system. The radius of the acquisition range circle (F, fig. 113) can be adjusted to represent any range from 0 to 250,000 yards. The RANGE switch (G, fig. 80) is set to a position that permits the range circle to fall within the confines of the scope face. When the range MAN–AID switch (E, fig. 79) on the target designate control-indicator (fig. 24) is set to the MAN position, the range circle is moved in or out in range by rotating the range handwheel (C, fig. 79). The range SLEW switch (D, fig. 79) should be operated, when rapid movement of the range circle in either direction is desired. When the range MAN–AID switch is in the AID position, the acquisition range circle moves in or out in range after the range handwheel is turned and released. The rate and direction it moves remains the same as the rate and direction were at the time the range handwheel was released. The RANGE dial (A, fig. 79) indicates, in thousands of yards, the range represented by the acquisition range circle.

2. *Azimuth switch and azimuth knobs.* When the azimuth switch (F, fig. 79) is depressed and held, all displays are removed from the PPI (fig. 24) on the battery-control console, and the steerable azimuth line(fig. 114) appears. The azimuth knob (coarse) (H, fig. 79) is used for coarse positioning of the steerable azimuth line, and the azimuth knob (fine) (G, fig. 79) is used for precision positioning of the steerable azimuth line. To designate the target in azimuth to the target-tracking radar system, the steerable azimuth line must be positioned to coincide with the target video (B, fig. 113). The steerable azimuth line becomes the acquisition (flashing) azimuth line when the azimuth switch is released.

3. *MTI–MODE switch and MTI–SECTOR ANGLE knob.* The moving target indicator (MTI) circuitry distinguishes between acquisition radar return signals from moving targets and those from stationary targets. When the MTI–MODE switch (EE, fig. 82) is set to the 360° position, the MTI circuitry is energized and is effective through the 360° rotation of the rotating radial sweep (C, fig. 113) on the PPI. When the MTI circuitry is operating, acquisition radar return signals from stationary objects such as ground clutter are largely eliminated from the PPI presentation, but acquisition radar return signals from moving targets are displayed on the PPI presentation with only a slight decrease in intensity. When the MTI-MODE switch is set to the OFF position, the MTI circuitry has no effect on the PPI presentation. When the MTI–MODE switch is set to the SECTOR position, the MTI circuitry is limited so that it

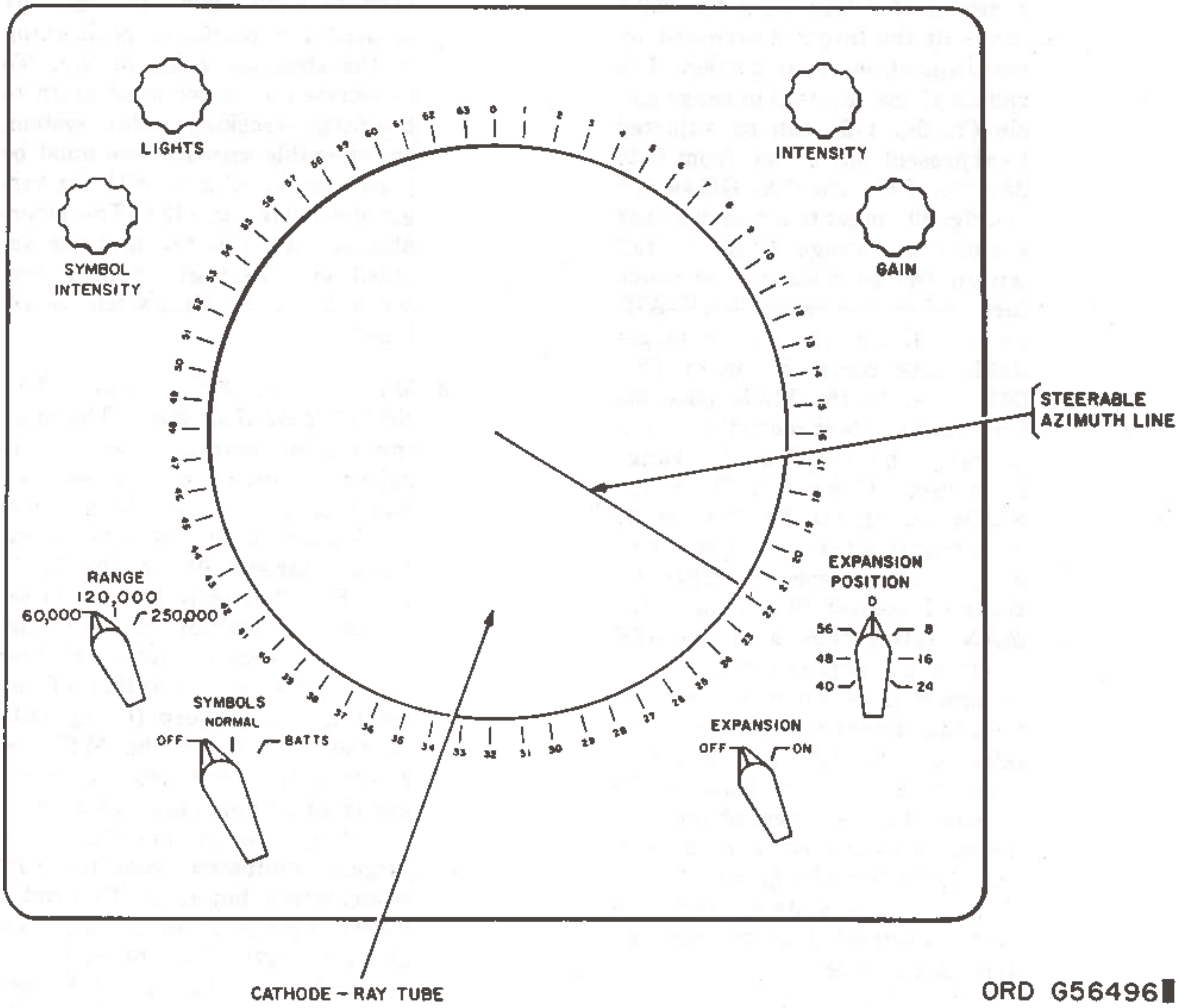


Figure 114 (CMHA). PPI presentation—steerable azimuth line present.

affects only a predetermined sector of the PPI. The MTI-SECTOR ANGLE knob (FF, fig. 82) is used to position this sector in azimuth. An audible signal is sounded when a moving target enters a predetermined area of the 360° azimuth scan. The alarm circuits have been removed in selected NIKE-HERCULES Systems incorporating auxiliary acquisition radar (AAR).

4. RECEIVER-GAIN knob and RECEIVER-STC knob. The RECEIVER-GAIN knob (CG, fig. 82) on the acquisition control-indicator (fig. 24) controls the gain of the acquisition radar receiver. When the gain knob is correctly adjusted, optimum resolution of the radar signals is obtained on the PPI. The RECEIVER-STC (sensitivity time control) knob (AA, fig. 82) permits the operator to reduce the intensity of acquisition radar return signals from objects at close ranges. This helps the operator to distinguish targets which may be obscured by ground clutter or blossoming as displayed on the PPI. In NIKE-HERCULES systems with anti-jam display (AJD) capabilities the RECEIVER-GAIN knob, when turned fully clockwise, operates a microswitch. This action completes relay circuits that permit the receiver preamplifier to operate at maximum gain. Simultaneously, gated fast automatic gain control (FAGC) bias is applied to the main IF amplifier.

Note. Key numbers shown in parentheses in (3) below refer to figure 113.1.

(3) *AJD presentation.* The primary difference, as indicated on the PPI, in systems incorporating AJD, consists of jam strobes (2 and 7). These strobe lines appear at the exact azimuth of each jamming target (3 and 6). The long persistance phosphor of the scope permits numerous jam strobes to be observed simultaneously. If the target is obscured by the strobe line, only azimuth information is transmitted to the target tracking radar during the target designate phase of operation. Other video and reference marks shown on figure 113.1 are common to presentation systems with or without AJD. Operation and control of anti-jam displays are described in paragraphs 82*e* and 83*a*(2).

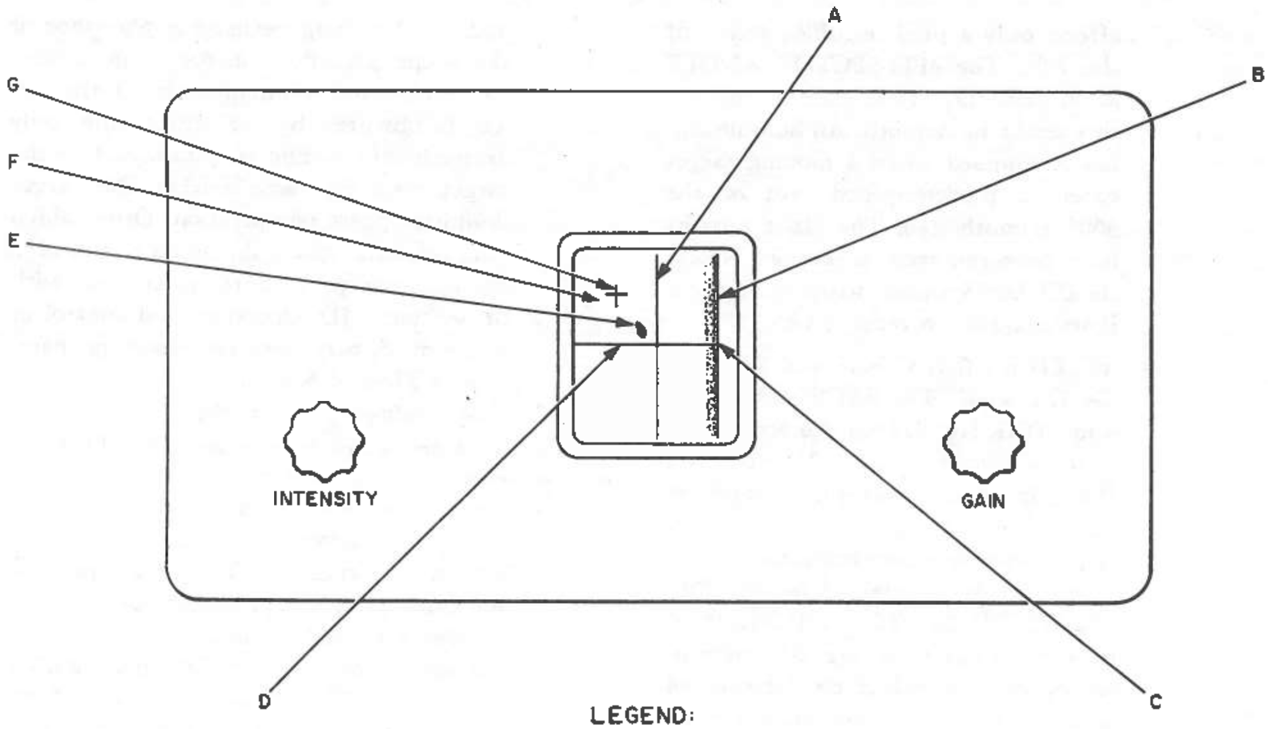
b. Precision Indicator Presentation.

Note. Key letter shown in parentheses in (1) below refer to figure 115 unless otherwise indicated.

(1) *Basic presentation.* The basic presentation of the precision indicator (fig. 24) is shown in figure 115. The basic precision indicator presentation appears on the face of the cathode-ray tube (F) as an expanded portion of the PPI presentation (fig. 113). This portion represents 8000 yards in range and approximately 500 mils in azimuth, centered about the intersection of the acquisition range circle (F, fig. 113) and the acquisition (flashing) azimuth line (E, fig. 113). The presentation consists of target video (E) and the following reference marks: a sweep (B), an acquisition flashing azimuth line (A), an acquisition range circle (D), an acquisition range mark (C), and an electronic cross (G).

(*a*) *Sweep.* The sweep (B) travels from left to right in synchronism with the rotation of the acquisition antenna (fig. 39). Once during each revolution the sweep brightens all displays on the cathode-ray tube (F) as the sweep coincides with each display.

(*b*) *Acquisition (flashing) azimuth line.* The acquisition (flashing) azimuth line (A) appears as a brightened vertical line once each time the sweep (B) travels across the cathode-ray tube (F).



LEGEND:

A – ACQUISITION (FLASHING) AZIMUTH LINE

B – SWEEP

C – ACQUISITION RANGE MARK

D – ACQUISITION RANGE CIRCLE

E – TARGET VIDEO

F – CATHODE-RAY TUBE

G – ELECTRONIC CROSS

RA PD 417301

Figure 115 (U). Precision indicator—basic presentation.

The acquisition (flashing) azimuth line (A) represents an 8,000-yard range segment of the acquisition (flashing) azimuth line (E, fig. 113) on the PPI presentation, 4000 yards on each side of the acquisition range circle (F, fig. 113).

(*c*) *Acquisition range mark and acquisition range circle.* The acquisition range circle (D) appears as a horizontal line and is a result of the acquisition range mark (C). The intersection of the acquisition (flashing) azimuth line (A) and the acquisition range circle (D) is centered on the cathode-ray tube (F) and represents an expanded portion of the same intersection of the PPI presentation (fig. 113). The expanded portion of this intersection provides the operator with the information necessary to more accurately determine the range and azimuth of the selected targets.

(*d*) *Target video.* The target video (E) appears as a brightened dot each time the sweep (B) travels across the cathode-ray tube (F). When the intersection of the acquisition (flashing) azimuth line (A) and the acquisition range circle (D) is superimposed on the target video the presentation system of the acquisition radar system indicates the azimuth and range of the selected target.

(*e*) *Electronic cross.* The electronic

cross (G) appears after the target has been designated to the target-tracking radar system and the ACQUIRE switch (F, fig. 96) on the target track control drawer (fig. 34) on the target radar control console has been operated. The electronic cross is described in detail in paragraph 83*a*(1)(e).

(2) *Operation of controls affecting presentation.* The INTENSITY knob (A, fig 81) and the GAIN knob (B, fig. 81) on the precision indicator (fig. 24) are used to condition the cathode-ray tube (F, fig. 115) for the desired presentation. The INTENSITY knob is used to adjust the intensity of all displays shown on the face of the precision indicator. The GAIN knob is used to adjust the intensity and resolution of all displays, except the sweep (B, fig. 115).

84 (CMHA). Description of Fire Unit Integration Facility (FUIF) Presentation

a. Presentation Associated With FUIF Equipment Used at a Semimobile Site. Target identification, battery engagement, and battery position information transmitted by the Army Air Defense Command Post (AADCP) to the FUIF equipment at a semimobile site appears on the PPI (fig. 24) on the battery-control console in the form of symbols, provided the SYMBOLS switch (F, fig. 80) on the PPI is set to the NORMAL position or the BOTH position. When the SYMBOLS switch is set to the OFF position, or operated to the BATTS position, no FUIF information appears on the PPI, and the PPI presentation appears as explained in paragraph 83. Each type of symbol used to present FUIF information is explained and described in (1) through (4) below.

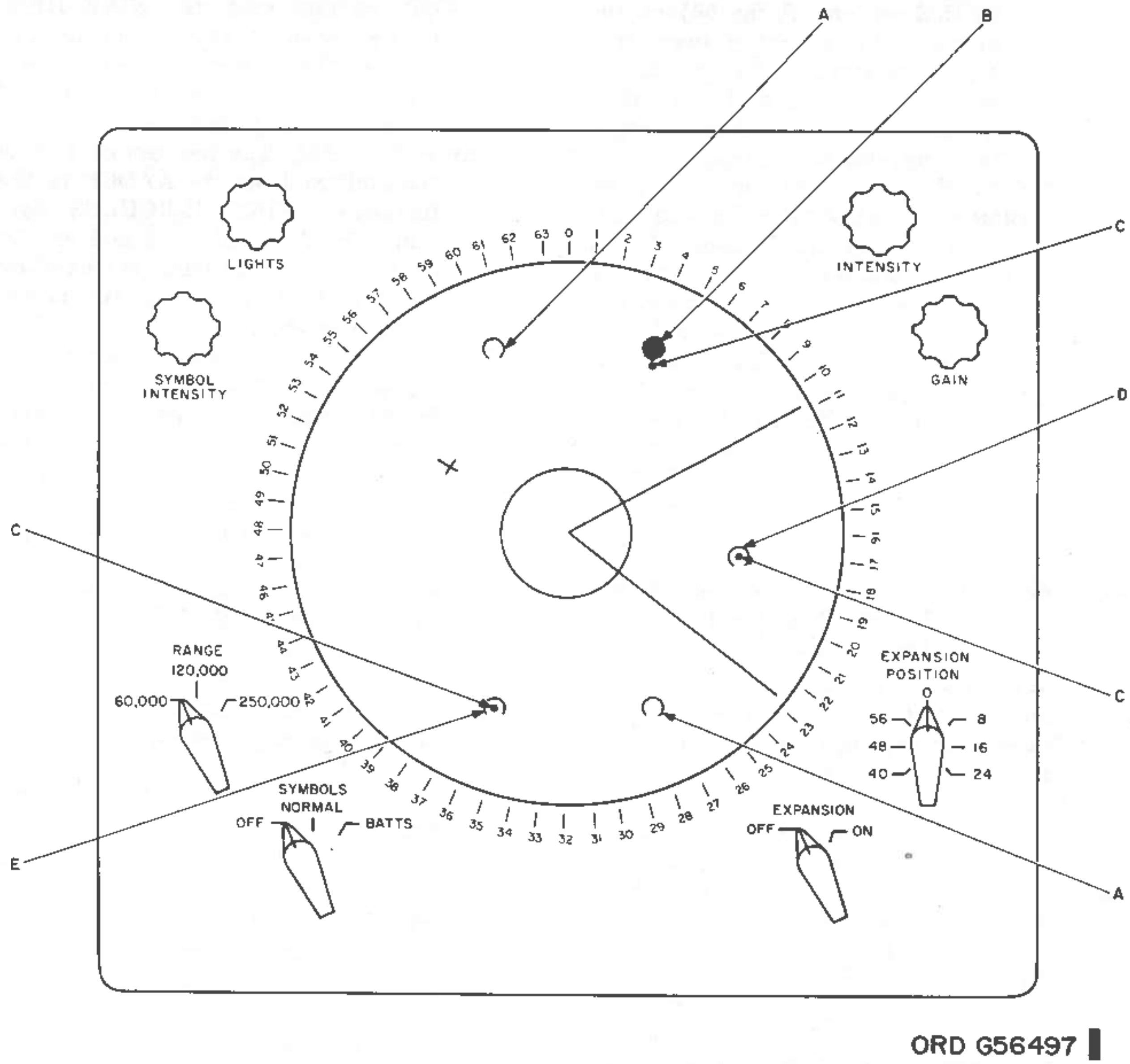
Note. All key letters in (1) through (4) below refer to figure 116.

(1) *Friend symbol.* The friend symbol (D) is transmitted from the Army Air Defense Command Post (AADCP) to the integrated NIKE-HERCULES System. This symbol appears on the PPI presentation as a semicircle over the target video (C) of the target being identified.

(2) *Foe symbol.* The foe symbol (E) is transmitted from the AADCP to the integrated NIKE-HERCULES System. The foe symbol appears as 330 degrees of a small circle surrounding the target video (C) of the target being identified.

(3) *Battery ground position symbol.* The battery ground position symbol (A) is transmitted from each integrated NIKE-HERCULES System to the AADCP and then to all integrated NIKE-HERCULES Systems. This symbol appears on the PPI as 330 degrees of a small circle. It represents the ground location of another integrated NIKE-HERCULES System and indicates that no target is being tracked by that system.

(4) *Battery engagement symbol.* The battery engagement symbol (B) is transmitted from the AADCP to all integrated NIKE-HERCULES Systems except the system chosen to engage the target. The battery engagement symbol appears as a defocused spot covering target video. The battery ground position symbol (A) representing the NIKE-HERCULES System chosen for the engagement moves from its present position to cover the target video, thus forming the battery engagement symbol. The NIKE-HERCULES System chosen for the engagement, however, receives a foe symbol, explained in (2) above.



A—Battery ground position symbol
B—Battery engagement symbol
C—Target video
D—Friend symbol
E—Foe symbol

Figure 116 (CMHA). PPI presentation—FUIF symbols present (U).

b. Presentation Associated with FUIF Equipment Used at a Permanent Site.

(1) Target identification, battery engagement, and battery position information from the Army Air Defense Command Post (AADCP) to FUIF equipment at a permanently emplaced NIKE–HERCULES System appears on the PPI (fig. 24) on the battery-control console in the form of symbols. These symbols are the same as those described for the semimobile site discussed in *a* above; however, the functional operation of the SYMBOLS switch (F, fig. 80) on the PPI is different.

(2) When the PPI is used with FUIF equipment at a permanent site, the friend symbol (D, fig. 116) and the foe symbol (E, fig. 116) only are displayed on the PPI presentation when the SYMBOLS switch is set to the NORMAL position or the BOTH position. The battery ground position symbol (A, fig. 116) and the battery engagement symbol (B, fig. 116) are displayed on the PPI presentation only when the SYMBOLS switch is operated to the BATTS position or the BOTH position.

85 (CMHA). Fire Unit Integration Facility (FUIF) Control

The controls and indicators explained in *a* and *b* below are used in determining the tactics

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to be employed by a NIKE-HERCULES System when used in an integrated fire control system. Two types of information are initiated or indicated by these controls and indicators. The controls and indicators explained in *a* below are used to transmit information from the Army Air Defense Command Post (AADCP) to the integrated NIKE-HERCULES System; those explained in *b* below are used to transmit information from the NIKE-HERCULES System to the AADCP.

a. Controls and Indicators Used to Transmit Data From the AADCP to the Integrated NIKE-HERCULES System.

(1) *REMOTE indicator light.* When illuminated, the REMOTE indicator light (A, 1, fig. 78) indicates that a command is being transmitted from the AADCP to the integrated NIKE-HERCULES System. The signal which illuminates this light causes a remote alarm buzzer behind the upper right frame (fig. 24) of the battery control console to sound, and a foe symbol (D, fig. 116) to appear on the PPI at the azimuth and range location of the target.

(2) *MISSILE-REM indicator lights.* A MISSILE-REM indicator light (D, E, F, or G, 1, fig. 77) on the battery signal panel-indicator (fig. 24) when illuminated, indicates the type of missile (I-HE, B-HE, B-XS, or B-XL) designated by the AADCP to be used by the integrated NIKE-HERCULES System for the current engagement.

(3) *HOLD FIRE indicator light.* When illuminated, the HOLD FIRE indicator light (B, 1, fig. 78) signals the integrated NIKE-HERCULES System not to fire until signaled to do so; however, the system is to continue tracking the present target. The signal which illuminates this light causes a remote alarm buzzer behind the upper right frame (fig. 24) of the battery control console to sound.

(4) *CEASE FIRE indicator light.* When illuminated the CEASE FIRE indicator light (C, 1, fig. 78) signals the integrated NIKE-HERCULES System to stop the present engagement. The signal which illuminates this light causes a remote alarm buzzer behind the upper right frame (fig. 24) of the battery control console to sound.

b. Controls and Indicators Used to Transmit Data From the Integrated NIKE-HERCULES System to the AADCP.

(1) *TARGET-DESIGNATED indicator lights and DESIGNATE-ABANDON switch.*

(*a*) When a target is to be designated to the target tracking radar system the DESIGNATE-ABANDON switch (B, fig. 79) on the target designate control-indicator (fig. 24) is operated to the DESIGNATE position. An acknowledge signal is automatically transmitted to the AADCP, causing the green TARGET-DESIGNATED indicator light (Q, 1, fig. 77) on the battery signal-panel indicator (fig. 24) to illuminate, and the ivory TARGET-DESIGNATED indicator light (J, 2, fig. 77) to extinguish. Signals representing the indications provided by these lights are transmitted to the AADCP.

(*b*) When a target is to be abandoned by the target tracking radar system the DESIGNATE-ABANDON switch (B, fig. 79) on the target designate control-indicator is set to ABANDON. This extinguishes the green TARGET-DESIGNATED indicator light (Q, 1, fig. 77) and illuminates the ivory TARGET-DESIGNATED indicator light (J, 2, fig. 77) on the battery signal panel-indicator. This action also extinguishes the green DESIGNATE indicator light (A, fig. 92) and illuminates the ivory DESIGNATE indicator light (M, fig. 92) indicating the target currently being tracked is to be abandoned. The abandon circuits are inoperative from the time the fire command is initiated until the missile burst signal is received. Signals representing the indications provided by these lights are transmitted to the AA DCP.

(2) *TARGET-TRACKED indicator lights and TRACKED switch.* When the designated target is being tracked by the target tracking radar system, the TRACKED switch (G, fig. 96) on the target track control drawer (fig. 34) is operated, causing the green TARGET-TRACKED indicator light (S, 1, fig. 77) to illuminate, and the ivory TARGET-TRACKED indicator light (L, 2, fig. 77) to extinguish. Signals representing the indications provided by these lights are transmitted to the AADCP.

(3) *FIRE indicator lights and FIRE switch.* When a missile is to be fired, the FIRE switch (V, 1, fig. 78) on the tactical control-indicator (fig. 24) is operated, causing the green FIRE indicator light (U, 1, fig. 77) on the battery signal-panel indicator (fig. 24) to illuminate and the ivory FIRE indicator light (N, 2, fig. 77) to extinguish. Signals representing the indications provided by these lights are transmitted to the AADCP.

(4) *ACKNOW switch.* When the ACKNOW switch (C, 2, fig. 78) is depressed, a signal is transmitted to the AADCP indicating that a signal transmitted to the integrated NIKE-HERCULES System from the AAD CP has been received, and the required action is being or will be taken. The remote alarm buzzer behind the upper right frame (fig. 24) of the battery-control console is silenced.

(5) *LOCAL indicator light and LOCAL switch.* When the operating functions of an integrated NIKE-HERCULES system are under local command, the LOCAL switch (B, 2, fig. 78) is depressed, causing the LOCAL indicator light (A, 2, fig. 78) to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

(6) *OUT OF ACTION indicator light and OUT OF ACTION switch.* When the integrated NIKE-HERCULES System is incapable of normal action, the OUT OF ACTION switch (D, 2, fig. 78) is depressed, causing the OUT OF ACTION indicator light (E, 2, fig. 78) to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

(7) *ONE indicator light and ONE switch.* When the designated target is a single aircraft, the ONE switch (P, 2, fig. 78) is depressed, causing the ONE indicator light (Q, 2, fig. 78) on the tactical control-indicator (fig. 24) to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

(8) *FEW indicator light and FEW switch.*

When the designated target consists of two to five aircraft, the FEW switch (L, 2, fig. 78) is depressed, causing the FEW indicator light (R, 2, fig. 78) on the tactical control-indicator (fig. 24) to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

(9) *MANY indicator light and MANY switch.* When the designated target consists of more than five aircraft, the MANY switch (X, 1, fig. 78) is depressed, causing the MANY indicator light (Y, 1, fig. 78) on the tactical control-indicator (fig. 24) to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

(10) *EFFECTIVE indicator light and EFFECTIVE switch.* At the conclusion of a successful engagement, the EFFECTIVE switch (M2, fig. 78) is depressed, causing the EFFECTIVE indicator light (N2, fig. 78) on the tactical control-indicator (fig. 24) to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

(11) *INEFFECTIVE indicator light and INEFFECTIVE switch.* At the conclusion of an unsuccessful engagement, the INEFFECTIVE switch (K2, fig. 78) is depressed, causing the INEFFECTIVE indicator light (J2, fig. 78) on the tactical control-indicator (fig. 24) to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

(12) *KILL switch.* At the completion of a successful engagement, the KILL switch (Z, 1, fig. 78) on the tactical control-indicator (fig. 24) is depressed. A signal representing the successful engagement is then sent to the AADCP.

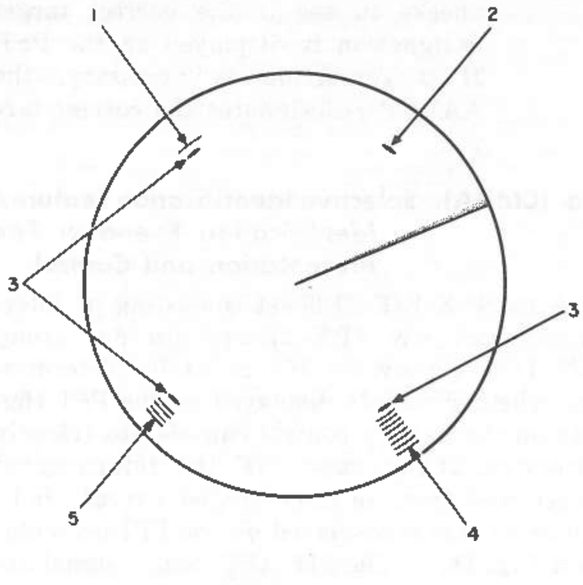
(13) *VALIDITY switch.* When the VALIDITY switch (S, 2, fig. 78) is depressed, a signal is transmitted to the AADCP requesting verification of the target designation. The AADCP checks to see if the correct target designation is displayed on the PPI. If a correction is necessary, the AADCP redesignates the correct target.

86 (CMHA). Selective Identification Feature/Identification Friend or Foe Presentation and Control

A mark X SIF/IFF set consisting of interrogator set AN/TPX-27 and decoder group AN/TPA-3 provides 165 codes for determining whether targets displayed on the PPI (fig. 24) on the battery control console are friendly or hostile. If the proper SIF/IFF return signal is received from an interrogated aircraft, indication of this is displayed on the PPI presentation (fig. 117). The SIF/IFF return signal appears as one or more parallel arcs, up to six, at a position slightly greater in range than the target video (3, fig. 117). SIF/IFF presentations are described in *a* below. The controls and indicators used to control the mode, code, and presentation of the SIF/IFF equipment are described in *b* through *e* below.

a. SIF/IFF Presentation. The IFF-MODE switch (T, fig. 82) on the acquisition control-indicator (fig. 24) selects the pulse spacing necessary for proper interrogation of an aircraft SIF/IFF transponder. The SIF/IFF return signal from an interrogated aircraft is applied to the video decoder (fig. 69.1) mounted in the equipment cooling cabinet (fig. 18.1). If the SIF/IFF return signal agrees with the preselected SIF/IFF code of the mark X SIF/IFF set, the video decoder produces a video display on the PPI representing the pulse coded SIF/IFF return signal from the interrogated aircraft SIF/IFF transponder. The four types of video displays for SIF/IFF interrogated targets and test signals are described in (1) through (4) below.

(1) *Mode 1, 2, or 3 return signal.* The mode 1, 2, or 3 return signal (1, fig. 117) is displayed as one or more parallel arcs, up to six at a position slightly greater in range than the target video (3, fig. 117). The number of parallel arcs is determined by the coded pulse train of the SIF/IFF re-



1—Mode 1, 2, or 3 return signal
2—Unidentified target video
3—Target video
4—Mode 1, 2, or 3 test signal
5—Emergency mode return signal

Figure 117 (CMHA). PPI–SIF/IFF presentation (U).

turn signal from the interrogated aircraft SIF/IFF transponder.

(2) *Unidentified target video.* Unidentified target video (2, fig. 117) indicates that the interrogated aircraft SIF/IFF transponder is set to transmit on either a different code, or a different mode and code, or that the interrogated aircraft is hostile. There are no parallel arcs displayed on the PPI for unidentified targets.

(3) *Emergency mode return signal.* The emergency mode return signal (5, fig. 117) is displayed on the PPI as four parallel arcs at a position slightly greater in range than the target video (3, fig. 117). The emergency mode return signal may be transmitted by an aircraft SIF/IFF transponder which has been interrogated by any mode or code setting of interrogator set AN/TPX-27.

(4) *Mode 1, 2, or 3 test signal.* The receiver-transmitter (fig. 46) may be tested by using the recognition signal simulator to generate local test signals. The mode 1, 2, or 3 test signal (4, fig. 117) may be coded to display one or more parallel arcs, up to eight, representing the pulse coded signal coupled into the SIF/IFF receiver-transmitter from the recognition signal simulator.

b. SIF/IFF Controls on the IFF Receiver-Transmitter and Coder Control. To operate the SIF/IFF system from the acquisition control-indicator (fig. 24), the POWER switch (K, fig. 109) on the SIF/IFF receiver-transmitter, and the POWER–ON–OFF switch (A, fig. 109) on the recognition signal simulator are set to ON, the CHALLENGE switch (H, fig. 109) on the coder control is set to OFF, and the LOCAL–REMOTE switch (J, fig. 109) on the coder control is set to REMOTE. Normally, these controls are left in these positions so the SIF/IFF equipment is automatically energized when power is applied to the acquisition radar system.

c. SIF/IFF Controls on the Recognition Signal Simulator. To test the operation of the SIF/IFF receiver and video decoder from the acquisition control-indicator (fig. 24), the POWER–OFF–ON switch (B, fig. 69.1) is set to ON and the B+ ON–LOCAL–REMOTE switch (E, fig. 109) is set to REMOTE. The TRIG IN–PULSE–MODE 2 switch (B, fig. 109) is set to MODE 2 and the OUTPUT–PULSE–

CODE switch (F, fig. 109) is set to CODE. The OUTPUT-LEVEL knob (D, fig. 109) and the OUTPUT-DELAY knob (C, fig. 109) are turned fully clockwise. These controls are left in this position except when testing the receiver locally.

d. SIF/IFF Controls and Indicators on the Acquisition Control-Indicator.

(1) *IFF-ON indicator light.* The IFF-ON indicator light (L, fig. 82) illuminates when power is applied to the acquisition radar system, provided the POWER switch (K, fig. 109) on the SIF/IFF receiver-transmitter and the POWER-ON-OFF switch (A, fig. 109) on the recognition signal simulator are set to the ON position, the CHALLENGE switch (H, fig. 109) on the coder control is set to the OFF position and the LOCAL-REMOTE switch (J, fig. 109) on the coder control is set to the REMOTE position. This indicates that power is being applied to the SIF/IFF receiver-transmitter and coder control, and that the SIF/IFF receiver-transmitter and coder control are conditioned for remote operation.

(2) *IFF-CHALLENGE switch and IFF-CHALLENGE ON indicator light.* When the IFF-CHALLENGE switch (R, fig. 82) is depressed, the IFF-CHALLENGE ON indicator light (Q, fig. 82) illuminates, and the aircraft represented by target video (3, fig. 117) on the PPI are interrogated.

(3) *IFF GAIN knob.* The IFF GAIN knob (K, fig. 82) is turned to obtain the brilliance desired for the SIF/IFF presentation of the PPI.

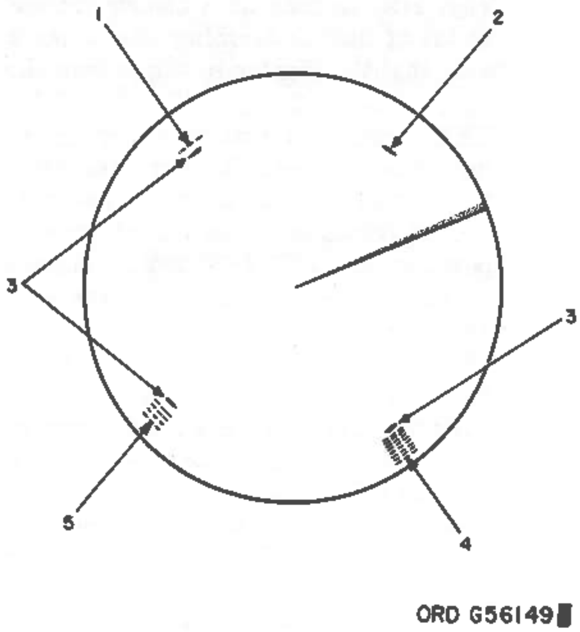
(4) *IFF-CHOP switch.* When the IFF-CHOP switch (DD, fig. 82) is set to the on (up) position, the SIF/IFF return signals on the PPI presentation (fig. 118) appear as a clearly defined series of dashes forming one or more arcs slightly greater in range than the target video (3, fig. 117). The IFF-CHOP switch controls a chopping relay, which is used to turn the chop rate group on and off. When the IFF-CHOP switch is set to the off (down) position, the SIF/IFF return signals appear as one or more solid arcs (fig. 117).

(5) *IFF-GTC switch.* The IFF-GTC (gain time constant) switch (S, fig. 82) controls the gain of the SIF/IFF receiver. When the IFF-GTC switch is set to the SHORT position, the SIF/IFF receiver is conditioned for relatively high level SIF/IFF return signals from nearby targets. When the IFF-GTC switch is set to the LONG position, the SIF/IFF receiver is conditioned for low level SIF/IFF return signals from distant targets. The IFF-GTC switch is set to the position which provides the best definition of the SIF/IFF return signals.

(6) *IFF-MODE switch.* The IFF-MODE switch (T, fig. 82) allows the operator to select either MODE 1, MODE 2, or MODE 3 for SIF/IFF operation. Each position of the switch provides numerous codes that can be selected. This increases the flexibility of the SIF/IFF system. The operation of the SIF/IFF modes is described in (*a*) below, and the emergency mode is described in (*b*) below.

Note. Because the three SIF/IFF modes function identically, only MODE 1 operation is discussed in (*a*) below.

(*a*) *SIF/IFF modes.* The difference in the three modes of operation is the number of codes available. With



1—Mode 1, 2, or 3 return signal
2—Unidentified target video
3—Target video
4—Mode 1, 2, or 3 test signal
5—Emergency mode return signal

Figure 118 (CMHA). PPI-SIF/IFF presentation—IFF-CHOP switch set to the ON position.

the OPERATE-TEST switch (BB, fig. 82) set to the OPERATE position, if the incoming SIF/IFF signal agrees with the preselected mode and code, a SIF/IFF return signal is displayed on the PPI presentation (fig. 117). The display is slightly greater in range than the target video (3, fig. 117), provided the target is friendly and its SIF/IFF transponder is functioning. When the OPERATE-TEST switch is set to the TEST position, the SIF/IFF test signal from the recognition signal simulator is displayed on the PPI.

(*b*) *Emergency mode.* This mode is intended for emergency use by interrogated aircraft. In this mode, the interrogated aircraft SIF/IFF transponder answers interrogation signals for all codes and modes of the SIF/IFF transmitter. Therefore, a separate emergency position is not necessary for the IFF-MODE switch (T, fig. 82). The SIF/IFF emergency mode return signal (5, fig. 117), displayed on the PPI, consists of four parallel arcs. These arcs are solid when the IFF-CHOP switch (DD, fig. 82) is set to the off (down) position, and dashed when the IFF-CHOP switch is set to the on (up) position.

e. SIF/IFF Controls on the IFF Auxiliary Control-Indicator.

(1) *MODE 1 CODE switch (inner knob).* The MODE 1 CODE switch (inner knob) (W, fig. 82) is a five-position rotary switch. When the MODE 1 CODE switch (inner knob) is set to any number between 0 and 3, it selects the first significant number of the code for mode 1 operation. When set to the REM position, the switch transfers control of the code settings from the master remote switching control to a remote point where auxiliary remote switching control may be utilized.

(2) *MODE 1 CODE switch (outer knob).* The MODE 1 CODE switch (outer knob) (V, fig. 82) is an eight-position rotary switch. When the switch is set to any number between 0 and 7, it selects the second significant number of the code for mode 1 operation.

(3) *MODE 2 CODE switch (inner knob).* The MODE 2 CODE switch (inner knob) (Y, fig. 82) is an eight-position rotary switch. When the switch is set

to any number between 0 and 7, it selects the first significant number of the code for mode 2 operation.

(4) *MODE 2 CODE switch (outer knob).* The MODE 2 CODE switch (outer knob) (X, fig. 82) is an eight-position rotary switch. When the switch is set to any number between 0 and 7, it selects the second significant number of the code for mode 2 operation.

(5) *MODE 3 CODE switch (inner knob).* The MODE 3 CODE switch (inner knob) (AA, fig. 82) is an eight-position rotary switch. When the switch (inner knob) is set to any number between 0 and 7, it selects the first significant number of the code for mode 3 operation.

(6) *MODE 3 CODE switch (outer knob).* The MODE 3 CODE switch (outer knob) (E, fig. 82) is an eight-position rotary switch. When the switch is set to any number between 0 and 7, it selects the second significant number of the code for mode 3 operation.

(7) *OPERATE-TEST switch.* The OPERATE-TEST switch (BB, fig. 82) is a two-position toggle switch. When the OPERATE-TEST switch is set to the OPERATE position, the coded pulses of the SIF/IFF return signal are sent to the video decoder (fig. 69.1). If the SIF/IFF return signal agrees with the preselected mode and code of the SIF/IFF interrogator set, one or more parallel arcs, up to six, are displayed on the PPI presentation (fig. 117). These parallel arcs appear on the same azimuth, at a slightly greater range than the target video. When the OPERATE-TEST switch is set to the TEST position, the coded pulses from the recognition signal simulator are applied to the video decoder. If the coded pulses from the signal simulator agree with the preselected mode and code of the SIF/IFF interrogator set, one or more parallel arcs, up to eight, are displayed on the PPI presentation. When the OPERATE-TEST switch is set to the TEST position, the signal simulator may be used for testing the SIF/IFF receiver and the video decoder.

87 (U). Target-Tracking Radar Equipment Control

During an engagement, the operation of the target-tracking radar system is functionally related to the operation of the acquisition radar system and the computer system. The acquisition radar system provides a means for designating a target in azimuth and range to the target-tracking radar system. The computer system is in turn provided with the necessary target position information (azimuth, elevation, and range) by the target-tracking radar system. Although the target-tracking radar system is functionally related to the acquisition radar system and the computer system, operation of the target-tracking radar system, as performed by the operator, is controlled

entirely by controls on the target radar control console (fig. 34). This paragraph groups these controls according to control functions. Each group is separately discussed in *a* through *f* below.

a. Target Range Control. Target range, as represented by the target-tracking radar system, is controlled by the range system of the target-tracking radar system. All controls necessary for operation of the range system are on the target track control drawer (fig. 34). The range of the target-tracking radar system is indicated on the range dial (D, fig. 98) of the range indicator (fig. 34) on the target radar control console. The RANGE switch (G, fig. 97) on the electric light control (fig. 34) must be set to the down position to enable operation of the range system controls. The range system has three modes of operation: manual, aided, and automatic.

(1) *Manual mode.*

(a) To operate in the manual mode of operation, the range MAN-AID-AUTO switch (L, fig. 96) is set to the MAN position, and the range handwheel (P, fig. 96) is then rotated as required to increase or decrease target range as represented by the range circuits of the target-tracking radar system. The range SLEW switch (K, fig. 96) may be operated to increase or decrease this range at a more rapid rate than is provided by rotating the range handwheel.

(b) The ACQUIRE switch (E, fig. 96), when operated, causes the target-tracking radar system to automatically slew to the range represented by the acquisition range circle (F, fig. 113) on the PPI (fig. 34) on the target radar control console.

(2) *Aided mode.* To operate in this mode, the range MAN-AID-AUTO switch (L, fig. 96) must be set to the AID position. When the range MAN-AID-AUTO switch is in the AID position and the range handwheel (P, fig. 96) is rotated and then released, target range as represented by the range circuits of the target-tracking radar system automatically continues to increase or decrease. The direction and rate at which the range continues to increase or decrease remains the same as that of the range handwheel at the time manual rotation was discontinued. This direction and rate continue until the range handwheel is rotated in the opposite direction, or until the range MAN-AID-AUTO switch is set to the MAN or AUTO position.

(3) *Automatic mode.*

(a) If the range MAN-AID-AUTO switch (L, fig. 96) is set to the AUTO position, the target-tracking radar system locks on and automatically tracks the designated target in range provided conditions given in *1* and *2* below are fulfilled.

1. The designated target is presently being tracked in azimuth and elevation in either the manual, aided, or automatic mode.

2. The designated target is presently being tracked in range in either the manual or aided mode.

b. Target Azimuth Control. Azimuth of the target as represented by the target-tracking radar system is controlled by the azimuth positioning system of the target-tracking radar system. All controls necessary for the operation of the azimuth positioning system are on the target track control drawer (fig. 34) on the target radar control console. The azimuth position of the track antenna reflector assembly (fig. 50) is indicated on the azimuth dial (D, fig. 98) on the azimuth indicator (fig. 34) of the target radar control console. The AZ switch (F, fig. 97) on the electric light control (fig. 34) must be set to the down position to enable operation of the azimuth positioning system controls. The target-azimuth positioning system has three modes of operation: manual, aided, and automatic.

(1) *Manual mode.*

(*a*) To operate in the manual mode, the azimuth MAN-AID-AUTO switch (D, fig. 96) is set to the MAN position, and the azimuth handwheel (H, fig. 96) is rotated either clockwise or counterclockwise to position the track antenna reflector assembly (fig. 50) associated with the target-tracking radar system to the desired azimuth.

(*b*) The ACQUIRE switch (E, fig. 96), when operated, causes the track antenna reflector assembly to automatically slew to the azimuth represented by the acquisition (flashing) azimuth line (E, fig. 113) on the PPI (fig. 34) on the target radar control console.

(2) *Aided mode.* To operate in this mode, the azimuth MAN-AID-AUTO switch (D, fig. 96) must be set to the AID position. When the azimuth MAN-AID-AUTO switch is in the AID position, and the azimuth handwheel (H, fig. 96) is rotated and then released, the azimuth position of the target as represented by the azimuth positioning system of the target-tracking radar system automatically continues to increase or decrease. The direction and rate at which the azimuth position continues to increase or decrease remains the same as that of the azimuth handwheel at the time manual rotating was discontinued. The direction and rate continues until the azimuth handwheel is rotated in the opposite direction, or until the azimuth MAN-AID-AUTO switch is set to the MAN or AUTO position.

(3) *Automatic mode.* If the azimuth MAN-AID-AUTO switch (D, fig. 96) is set to the AUTO position, the target-tracking radar system locks on and automatically tracks the designated target in azimuth, provided conditions given in *(a)* and *(b)* below are fulfilled.

(*a*) The designated target is presently being tracked in elevation and range in either the manual, aided, or automatic mode.

(*b*) The designated target is presently being tracked in azimuth in either the manual or aided mode.

c. Target Elevation Control. The elevation angle of the target as represented by the target-tracking radar system is controlled by the elevation positioning system of the target-tracking radar system. All controls necessary for the operation of the elevation positioning system are on the target track console drawer (fig. 34) on the target radar control console. The elevation position of the track antenna reflector assembly (fig. 50) is indicated on the elevation dial (D, fig. 98) of the elevation indicator (fig. 34) on the target radar control console. The ELEV switch (E, fig. 97) on the electric light control (fig. 34) must be set to the down position to enable operation of the elevation positioning system controls. The target elevation positioning system has three modes of operation: manual, aided, or automatic.

(1) *Manual mode.* To operate in this mode, the elevation MAN-AID-AUTO switch (A, fig. 96) is set to the MAN position, and the elevation handwheel (C, fig. 96) is rotated either clockwise or counterclockwise to position the track antenna reflector assembly (fig. 50) associated with the target-tracking radar system to the desired elevation angle. The eleva-

tion SLEW switch (B, fig. 96) may be operated to increase or decrease the elevation angle at a more rapid rate than is provided by the elevation handwheel.

(2) *Aided mode.* To operate in this mode, the elevation MAN-AID-AUTO switch (A, fig. 96) is set to the AID position. When the elevation MAN-AID-AUTO switch is in the AID position and the elevation handwheel is rotated and then released, the elevation angle of the target as represented by the elevation positioning system of the target-tracking radar system automatically continues to increase or decrease. The direction and rate at which the elevation angle continues to increase or decrease remains the same as that of the elevation handwheel at the time manual rotation was discontinued. This direction and rate continues until the elevation handwheel is rotated in the opposite direction, or until the elevation MAN-AID-AUTO switch is placed in the MAN or AUTO position.

***Caution:* Do not allow the antenna to drive into the antenna elevation stops.**

(3) *Automatic mode.* If the elevation MAN-AID-AUTO switch (A, fig. 96) is set to the AUTO position, the target-tracking radar system locks on and automatically tracks the designated target in elevation provided the conditions given in (*a*) and (*b*) below are fulfilled.

(*a*) The designated target is presently being tracked in azimuth and range in either the manual, aided, or automatic mode.

(*b*) The designated target is presently being tracked in elevation in either the manual or aided mode.

d. Magnetron Frequency Control. Magnetron frequency control consists of the operations necessary to establish the desired operating frequency of the magnetron associated with the transmitter system of the target-tracking radar system. The FREQUENCY switch (C, fig. 99) and the FREQUENCY meter (B, fig. 99) on the target track control power supply (fig. 34) are used in performing these operations. The FREQUENCY switch, when operated to the INCREASE or DECREASE position, increases or decreases, respectively, the frequency of the magnetron between 8500 and 9600 megacycles. When the FREQUENCY switch is released from either one of these positions, the frequency remains as it was at the time the switch was released. The FREQUENCY meter is graduated from 0 to 100 in increments of 5 representing the relative frequency of the magnetron.

e. Target High Voltage Control. Target high voltage control consists of the observations that must be made and the operations that must be performed by the operator to apply high voltage to and remove high voltage from the precision indicator, PPI, range indicator, azimuth indicator, and elevation indicator on the target radar control console (fig. 34) and the magnetron of the transmitter system of the target-tracking radar system. The controls and indicator lights used in performing these operations are discussed in (1) and (2) below.

(1) *Indicator high voltage control.* When the IND HV switch (G, fig. 99) on the target track control power supply (fig. 34) is turned to the on (up) position, high voltage is applied to the PPI, precision indicator, range indicator, azimuth indicator, and the elevation indicator on the target radar control console (fig. 34). This causes the cathode-ray tube of each indicator to illuminate, provided the INTENSITY knob (B, fig. 100) on the PPI, the INTENSITY knob (A, fig. 94) on the precision indicator, and the INTENSITY knob (B, fig. 98) on the elevation indicator, the azimuth indicator, and the range indicator are properly adjusted. This also causes the IND HV indicator light (F, fig. 99) on the target track

control power supply (fig. 34) to illuminate.

(2) *Magnetron high voltage control.*

(*a*) When illuminated, the HV SUPPLY-READY indicator light (L, fig. 99) on the target track control power supply (fig. 34) indicates that the necessary time delay has elapsed, and high voltage may be applied to the magnetron of the target-tracking radar system, provided the HV SUPPLY knob (M, fig. 99) is in the START position.

(*b*) When the HV SUPPLY-ON switch (H, fig. 99) is depressed the magnetron is energized, the HV SUPPLY-ON indicator light (J, fig. 99) illuminates and the HV SUPPLY-READY indicator light (L, fig. 99) extinguishes, provided the HV SUPPLY knob is in the START position. After the magnetron is energized, the current of the magnetron is controlled by the HV SUPPLY knob. Turn knob smoothly clockwise from the START position until 3 milliamperes of current is indicated on the upper scale of MAGNETRON meter (A, fig. 99).

***Caution:* Do not force knob beyond mechanical stops. If fluctuation is sufficient to actuate the overcurrent sensing device causing HV SUPPLY-ON indicator light (J, fig. 99) to extinguish, turn knob counterclockwise to START and notify an organizational maintenance technician.**

Note. To read the average magnetron current, MAGNETRON switch (N, fig. 99) must be in the center position (FS 5MA).

(*c*) To deenergize the magnetron, the HV SUPPLY knob is rotated counterclockwise to the START position and the HV SUPPLY-OFF switch (K, fig. 99) is depressed. The HV SUPPLY-READY indicator light (L, fig. 99) illuminates and the HV SUPPLY-ON indicator light (J, fig. 99) extinguishes.

88 (CMHA). Description of Target-Tracking Radar Presentations

a. General. Indicator presentations associated with the target tracking radar system are displayed on the following five cathode-ray tube indicators on the target radar control console (fig. 34) : the PPI, the precision indicator, elevation indicator, azimuth indicator, and range indicator. The presentation displayed on each of these indicators is discussed in *b* through *e* below.

b. PPI Presentation. The presentation (fig. 113) displayed on the cathode-ray tube on the PPI (fig. 34) on the target radar control console is identical to the basic presentation, explained in paragraphs 83*a* and 83 *a*(1), for the PPI (fig. 24) on the battery-control console. Four controls on the front of the PPI on the target radar control console are used to condition the cathode-ray tube for the desired presentation. The function of these controls is the same as the corresponding controls for the PPI on the battery-control console. The LIGHTS knob (A, fig. 100), the INTENSITY knob (B, fig. 100), and the GAIN knob (C, fig. 100) are explained in paragraph 83*a*(2) (*a*)*1*. The RANGE switch (E, fig. 100) is explained in paragraph 83*a*(2) (*a*)*3*.

c. Precision Indicator Presentation.

(1) The presentation displayed on the cathode-ray tube of the precision indicator (fig. 34) on the target radar control console is similiar to the pres-

entation for the precision indicator (fig. 24) on the battery-control console. The difference between the two presentations is described in (*a*) and (*b*) below.

(*a*) The presentation of the precision indicator on the battery-control console appears as an expanded portion of the PPI presentation (fig. 113). This portion represents 8000 yards in range and approximately 500 mils in azimuth, centered about the intersection of the acquisition range circle

(F, fig. 113) and the acquisition (flashing) azimuth line (E, fig. 113).

(*b*) The presentation of the precision indicator on the target radar control console also appears as an expanded portion of the PPI presentation (fig. 113). However, this portion represents 5,000 yards in range and approximately 500 mils in azimuth centered about the electronic cross (A, fig. 113).

(2) The two controls on the front of the precision indicator (fig. 94) on the target radar control console are used to condition the cathode-ray tube for the desired presentation. The function of these controls is the same as that for the corresponding controls, explained in paragraph 83*b*(2) on the precision indicator on the battery-control console.

d. Elevation Indicator and Azimuth Indicator Presentations.

Note. The elevation indicator presentation is identical to the azimuth indicator presentation; therefore, only the elevation indicator presentation is discussed in (1) through (4) below.

The elevation indicator presentation is presented by means of a cathode-ray tube and an elevation dial. One of two types of presentations is presented on the cathode-ray tube. The type of presentation is determined by the setting of the IMAGE SPACING switch (E, fig. 98) on the elevation indicator. The cathode-ray tube presentation as selected by the IMAGE SPACING switch is adjusted or varied by three controls on the front of the elevation indicator.

(1) *Presentation with IMAGE SPACING switch set to the OFF or NOR position.* The elevation indicator presentation is identical when the IMAGE SPACING switch is set to either the OFF or NOR position. This presentation is shown on figure 119. The presentation consists of an upper baseline and a lower baseline. The transmitted pulse, 500-yard expanded sweep, and the 100-yard range notch are on the upper baseline. The target "pip" on the upper baseline and the error "pip" on the lower baseline become part of the presentation when a target return signal is received by the target-tracking radar system.

(*a*) *Upper baseline.* The upper baseline (fig. 119) extends across the face of the cathode-ray tube and represents a maximum range of 200,000 yards, but may be adjusted to represent any range between 40,000 yards and 200,000 yards. The left end of the upper baseline represents 0 yards in range, and the right end represents the maximum adjusted range. Superimposed on the baseline is "grass" (noise) that reduces to a minimum when the target-tracking radar system is locked on the target.

(*b*) *Transmitted pulse.* The transmitted pulse (fig. 119) appears on the left end of the upper baseline, which represents 0 yard in range, and signifies that the target-tracking radar system is transmitting. It has no operational significance but appears only because of inherent characteristics of the target-tracking radar system.

(*c*) *500-yard expanded sweep.* The 500-yard expanded sweep (fig. 119) enlarges a segment of the upper baseline for better definition of a target "pip". The 500-yard expanded sweep moves left or right along the upper baseline as target range represented by the target-tracking radar system moves in or out.

(*d*) *100-yard range notch.* The 100-yard range notch (fig. 119) is centered within the 500-yard expanded sweep, and moves in or out in range as the

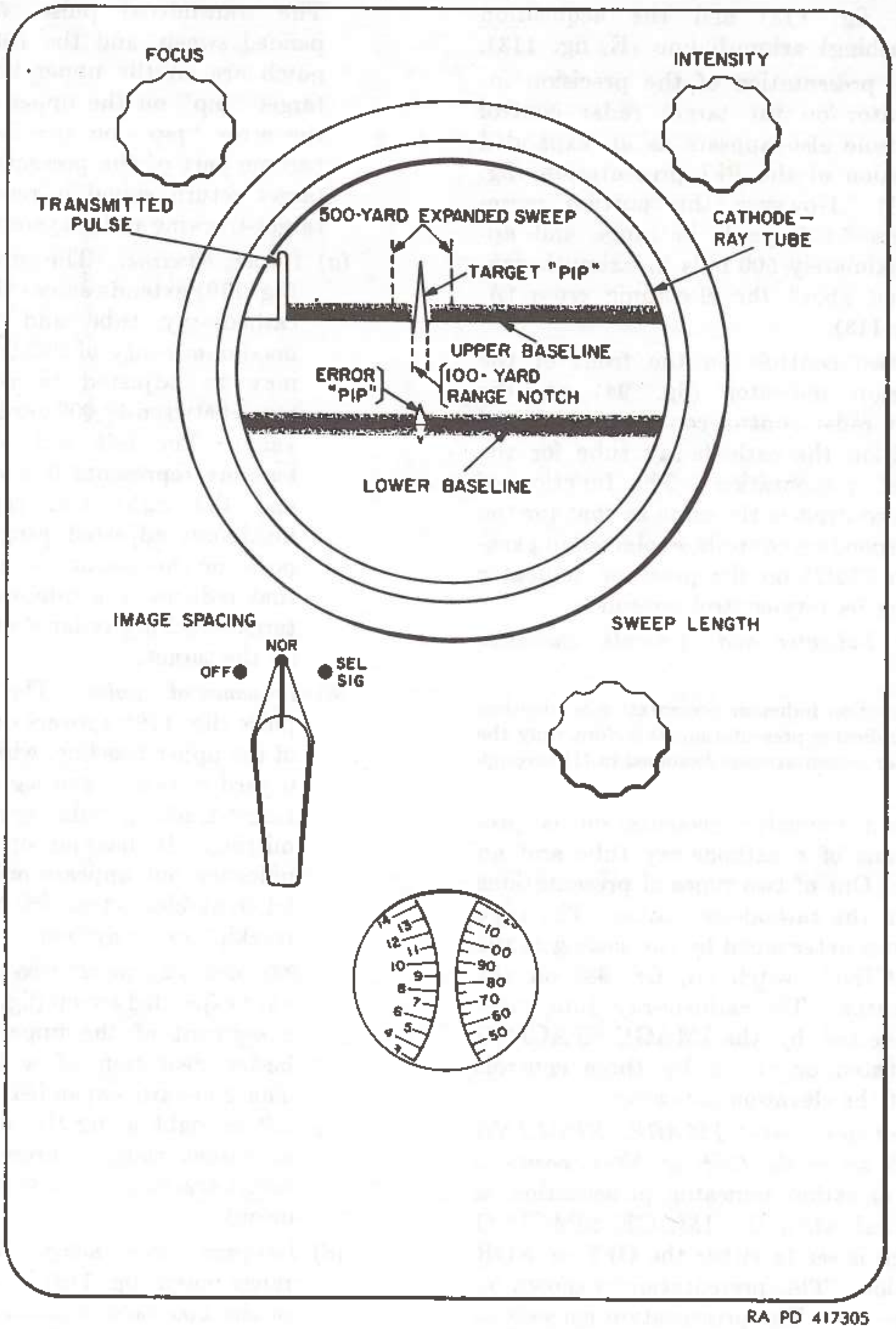


Figure 119. Elevation or azimuth indicator—presentation—image spacing switch set to OFF or NOR position.

500-yard expanded sweep moves in or out in range. The 100-yard range notch appears as a downward step in the upper baseline. When the target "pip" is in the 100-yard range notch, the track antenna reflector assembly (fig. 50) of the target-tracking radar system is positioned to the elevation of the target.

(*e*) *Target "pip"*. The target "pip" (fig. 119) becomes part of the elevation indicator presentation when the track antenna reflector assembly (fig. 50) associated with the target-tracking radar system is pointing at the target. When the target is being tracked, the target "pip" appears as a raised vertical spike in the 100-yard range notch.

(*f*) *Lower baseline and error "pip"*. The lower baseline (fig. 119) is a sweep that extends across the face of the cathode-ray tube beneath the upper baseline. Superimposed on the lower baseline is "grass" (noise) that reduces to a minimum when the target-tracking radar system is locked on the target. The error "pip" (fig. 119) on the elevation indicator presentation appears below the lower baseline when the track antenna reflector assembly (fig. 50) is pointing below the target, and the error "pip" appears above the lower baseline when the track antenna reflector assembly is pointing above the target. The error "pip" on the azimuth indicator presentation appears below the lower baseline when the track antenna reflector assembly is pointing to the left of the target, and the error "pip" appears above the lower baseline when the track antenna reflector as mbly is pointing to the right o' the target.

(2) *Presentation with IMAGE SPACING switch set to the SEL SIG position.* The elevation indicator presentation with the IMAGE SPACING switch (E, fig. 98) set to the SEL SIG position consists of only the 500-yard expanded sweep section of the upper baseline and lower baseline as shown on figure 120. Otherwise, the presentation is identical to that shown when the IMAGE SPACING switch is set to either the OFF or NOR position. The presentation with the IMAGE SPACING switch set to the OFF or NOR position is discussed in (1) above.

(3) *Operation of controls affecting presentation.* The presentation on the azimuth indicator and the elevation indicator is affected by four controls. The INTENSITY knob (B, fig. 98) on each indicator varies the brilliance of all displays on its associated indicator. The SWEEP LENGTH knob (C, fig. 98) adjusts the range represented by the length of the two sweeps, referred to as the upper baseline (fig. 119) and the lower baseline, on their respective indicators, from a maximum of 200,000 yards to a minimum of 40,000 yards. The FOCUS knob (A, fig. 98) on each indicator adjusts the clearness and sharpness of all displays on its associated indicator. The IMAGE SPACING switch (E, fig. 98) determines the type indicator presentation as discussed in (1) and (2) above.

(4) *Elevation dial.* The elevation dial (D, fig. 98) indicates the elevation angle of the track antenna reflector assembly (fig. 50) associated with the target track antenna-receiver-transmitter group. When the target "pip" (fig. 119) of the elevation indicator presentation is centered within the 100-yard range notch, the elevation dial indicates the target

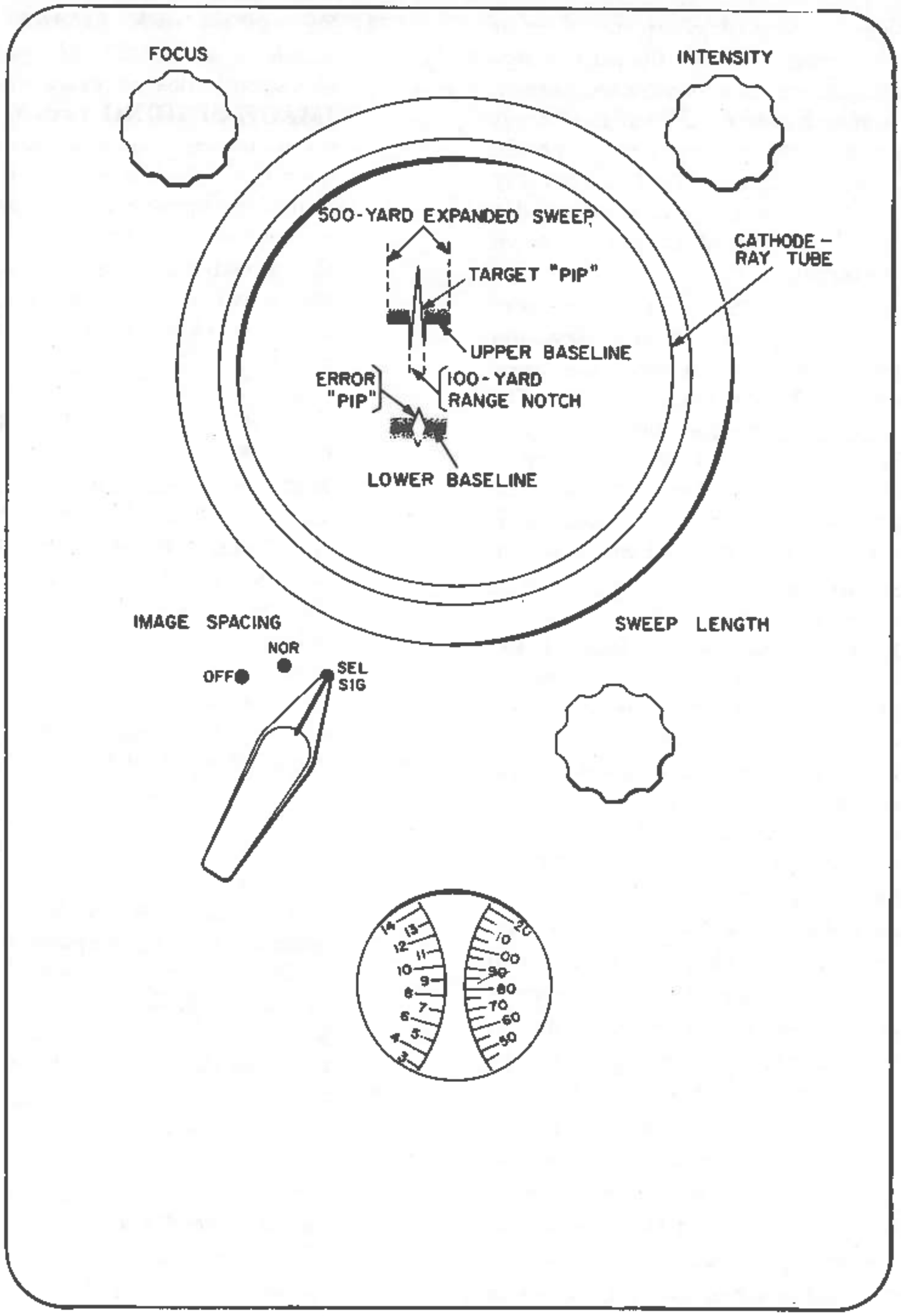


Figure 120. Elevation or azimuth indicator—presentation—IMAGE SPACING switch set to SEL SIG position.

elevation angle. The dial is graduated from 0 to 6400 mils in increments of 5 mils, but indicates only from −200 to +1550 mils.

Note. The azimuth dial on the azimuth indicator indicates 0 to 6400 mils continuous.

e. Range Indicator Presentation. The range indicator presentation is presented by means of a cathode-ray tube and a range dial. One of two types of presentations is presented on the cathode-ray tube. The type is determined by the setting of the IMAGE SPACING switch (E, fig. 98) on the range indicator. The cathode-ray tube presentation as selected by the IMAGE SPACING switch is adjusted or varied by three controls on the front of the range indicator.

(1) *Presentation with IMAGE SPACING switch set to OFF or NOR position.* The range indicator presentation with the IMAGE SPACING switch set to the OFF position is identical to the presentation with the IMAGE SPACING switch set to the NOR position. This presentation is shown on figure 121. The presentation consists of a transmitted pulse, 500-yard expanded sweep, and the 100-yard range notch superimposed on the baseline. The target "pip" becomes part of the presentation when a target return signal is received by the target-tracking radar system. The range indicator is normally operated with the IMAGE SPACING switch set in the OFF or NOR position.

(*a*) *Baseline.* The baseline (fig. 121) extends across the face of the cathode-ray tube and represents a maximum range of 200,000 yards, but may be adjusted to represent any range between 40,000 yards and 200,000 yards. The left end of the baseline represents 0 yards in range, and the right end represents the maximum adjusted range. Superimposed on the baseline is "grass" (noise) that reduces to a minimum when the target-tracking radar system is locked on the target.

(*b*) *Transmitted pulse.* The transmitted pulse (fig. 121) appears on the left end of the baseline, representing 0 yards in range, and signifies that the target-tracking radar system is transmitting. It has no operational significance, but appears only because of inherent characteristics of the target-tracking radar system.

(*c*) *500-yard expanded sweep.* The 500-yard expanded sweep (fig. 121) enlarges a segment of the baseline for better definition of a target "pip". The 500-yard expanded sweep moves left or right along the baseline as target range represented by the target-tracking radar system moves in or out.

(*d*) *100-yard range notch.* The 100-yard range notch (fig. 121) is centered within the 500-yard expanded sweep, and moves in or out in range as the 500-yard expanded sweep moves in or out in range. The 100-yard range notch appears as a downward step in the baseline. When the target "pip" is in the 100-yard range notch, the track antenna reflector assembly (fig. 50) of the target-tracking radar system is pointing at the target and the range unit is positioned to the range of the target.

(*e*) *Target "pip".* The target "pip" (fig. 121) becomes part of the range indicator presentation when the track antenna reflector assembly (fig. 50) of the target-tracking radar system is pointing at the target and the range unit is positioned to the range of the target. When the target is being tracked, the target "pip" appears

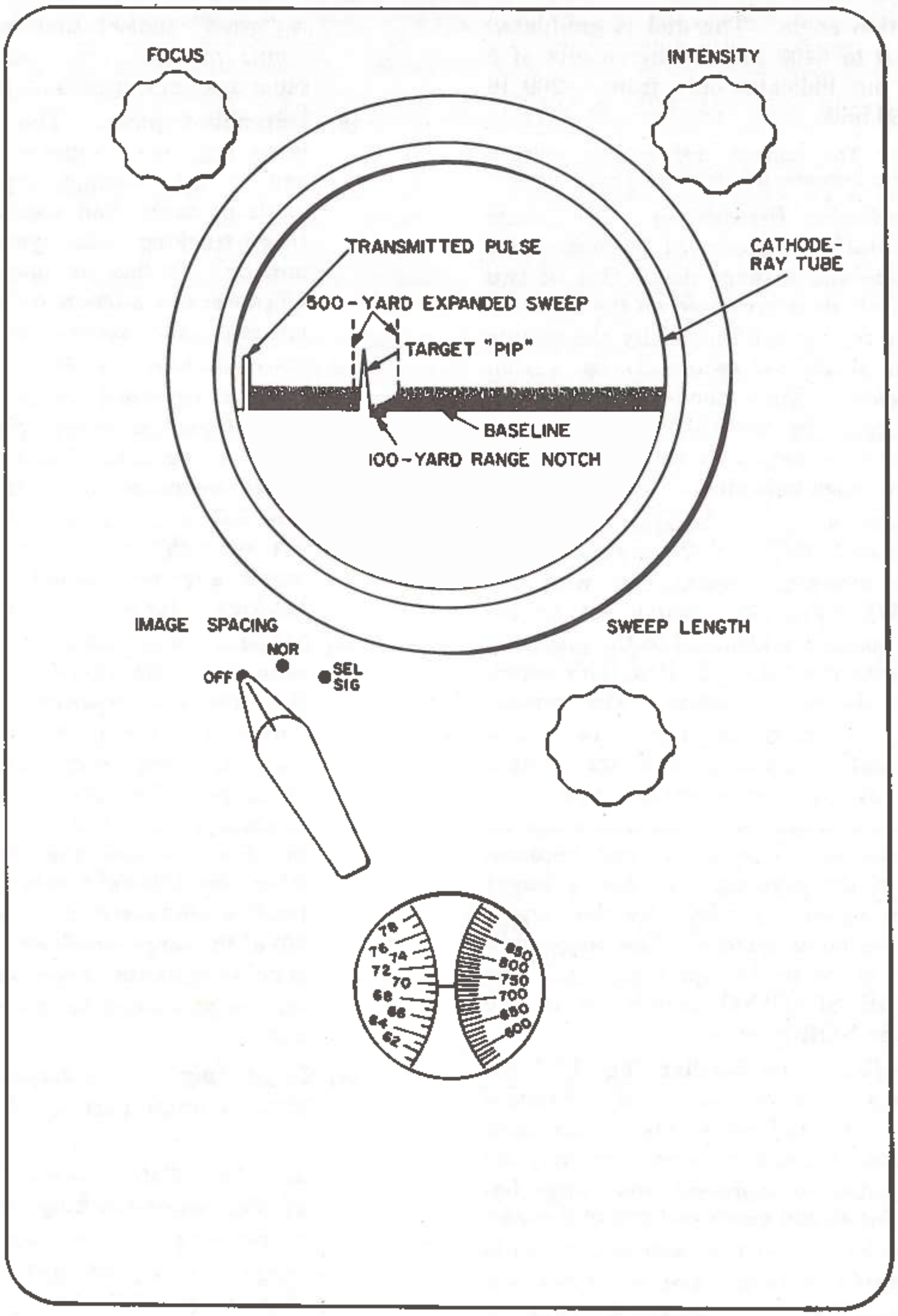


Figure 121. Range indicator (target radar control console)—presentation—IMAGE SPACING switch set to OFF or NOR position.

as a raised vertical spike in the 100-yard range notch.

(2) *Presentation with IMAGE SPACING switch set to the SEL SIG position.* The range indicator presentation with the IMAGE SPACING switch (E, fig. 98) set to the SEL SIG position, consists of only the 500-yard expanded sweep section of the baseline, as shown on figure 122. Otherwise, the presentation is the same as that shown when the IMAGE SPACING switch is set to either the OFF or NOR position. The presentation with the IMAGE SPACING switch set to the OFF or NOR position is discussed in (1) above.

(3) *Operation of controls affecting presentation.* The presentation on the range indicator is affected by four controls. The INTENSITY knob (B, fig. 98) varies the brilliance of all displays on the range indicator. The SWEEP LENGTH knob (C, fig. 98) adjusts the range represented by the sweep, referred to as a baseline (fig. 121), on the range indicator from a maximum of 200,000 yards to a minimum of 40,000 yards. The FOCUS knob (A, fig. 98) adjusts the clearness and sharpness of all displays on the range indicator. The IMAGE SPACING switch (E, fig. 98) determines the type presentation as described in (1) and (2) above.

(4) *Range dial.* The range dial (D, fig. 98) indicates at all times the range represented by the range system of the target-tracking radar system. When the target "pip" (fig. 121) of the range indicator presentation is centered within the 100-yard range notch, the range dial indicates the slant range of the target. The dial is graduated from 0 to 200,000 yards in increments of 10 yards.

f. Target-Tracking Radar Error Meter Presentation. The elevation pointing error of the track antenna reflector assembly (fig. 50) is indicated on the ELEVATION ERROR meter (A, fig. 93) on the azimuth and elevation deviation indicator (fig. 34). The azimuth pointing error of the track antenna reflector assembly is indicated on the AZIMUTH ERROR meter (B, fig. 93) on the azimuth and elevation deviation indicator. The meters are zero centered. An indication either side of zero indicates a pointing error and corresponds with the error "pip" (fig. 119) on the corresponding azimuth or elevation indicator. For example, an indication to the left on the ELEVATION ERROR meter occurs when an error "pip" appears below the lower baseline (fig. 119) on the elevation indicator.

89. Missile-Tracking Radar Equipment Control

a. General.

(1) During a normal engagement, the operation of the missile-tracking radar system is functionally related to the operation of the computer system and the launching equipment. The missile-tracking radar system supplies the computer system with missile position information, and the computer system, in turn, supplies the missile-tracking radar system with steering and burst orders for transmission to the missile.

(2) Control of the missile-tracking radar system, other than magnetron frequency control, automatic gain control, and missile high voltage control, is limited to acquiring, accepting or rejecting the missile prior to firing, or to performing tests on the missile-tracking radar system. During testing operations, the TEST switch (A, fig. 104) on the missile track control drawer (fig. 36) on the missile radar control console must be set to the TEST position. If the missile-tracking radar system is to use a missile

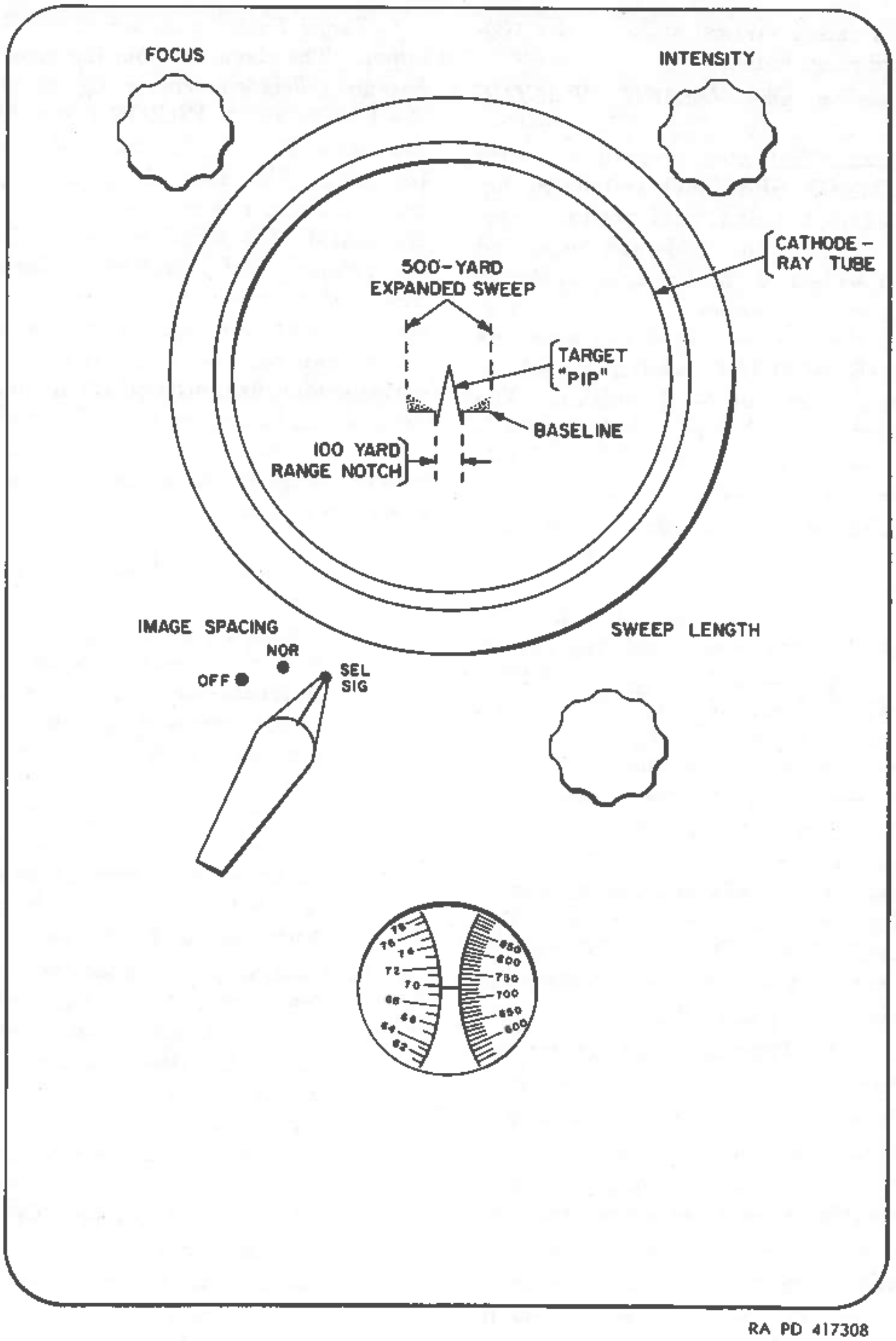


Figure 122. Range indicator—presentation—IMAGE SPACING switch set to SEL SIG position.

or the guided missile flight simulator during testing operations, the RECEIVER switch on the error voltage monitor in the radar set group (fig. 35) must be set to the MISSILE position. The missile-tracking radar system then receives a return signal which is transmitted from a missile or the guided missile flight simulator. This is known as beacon tracking. If the missile-tracking radar system is to receive a return signal which is a reflection of its own transmitted pulse, the RECEIVER switch must be set to the TARGET position. This is known as skin tracking. In this type tracking the missile-tracking radar system functions as a conventional target-tracking radar system. Therefore, the term missile when used in connection with testing operations in this paragraph, is synonymous with the term object or target, if it is considered that the RECEIVER switch is in the target position.

(3) Operation of controls used only during testing is discussed in *b* through *d* below. Operations other than testing operations are discussed in *e* through *g* below.

b. Missile Range Control. All controls necessary for operation of the range system of the missile-tracking radar system are on the missile track control drawer (fig. 36) on the missile radar control console. These controls function only when the TEST switch (A, fig. 104) is in the TEST position. The range represented by the missile-tracking radar system is indicated on the range dial (D, fig. 107) of the range indicator (fig. 36). The range system of the missile-tracking radar system has three modes of operation: manual, aided, and automatic.

(1) *Manual mode.*

(*a*) To operate in this mode the missile-tracking radar system must be placed in the test condition, and the range MAN-AID-AUTO switch (G, fig. 104) on the missile track control drawer (fig. 36) must be set to the MAN position. The range handwheel (E, fig. 104) is then rotated as required to increase or decrease missile range, as represented by the range circuits of the missile-tracking radar system. The range SLEW switch (F, fig. 104) may be operated to increase or decrease this range at a more rapid rate than is provided by rotating the range handwheel.

(*b*) When the computer system is conditioned for action or tracking test as explained in paragraph 91*b*(1)(*a*) and (*c*) and the LAUNCHER ACQUIRE switch (C, fig. 104) is operated, the missile-tracking radar system automatically slews to the range of the designated missile, or to the guided missile flight simulator in the event a missile has not been designated.

(2) *Aided mode.* To operate in this mode the missile-tracking radar system must be in the test condition and the range MAN-AID-AUTO switch (G, fig. 104) must be set to the AID position. When the range MAN-AID-AUTO switch is in the AID position and the range handwheel (E, fig. 104) is rotated and then released, missile range as represented by the range circuits of the missile-tracking radar system automatically continues to increase or decrease. The direction and rate at which the range continues to increase or decrease remains the same as that of the range handwheel at the time manual rotation was discontinued. This direction and rate continue until the range handwheel is rotated in the opposite direction, or until the range MAN-AID-AUTO switch is set to the MAN or AUTO position.

(3) *Automatic mode.*

(*a*) To operate in this mode the missile-tracking radar system must be in the test condition and the range MAN-AID-AUTO switch (G, fig. 104) must be set to the AUTO position. If the range MAN-AID-AUTO switch is set to the AUTO position, the missile-tracking radar system locks on and automatically tracks the designated missile in range provided:

1. The designated missile is presently being tracked in azimuth and elevation in either the manual, aided or automatic mode.

2. The designated missile is presently being tracked in range in either the manual or aided mode.

(*b*) If during automatic tracking, the missile-tracking radar system loses the missile in range, the target "pip" (fig. 123) no longer appears in the 100-yard range notch. However, if the coast DISABLE switch (M, fig. 104) is in the down position, the missile-tracking radar system continues to track the missile at the existing rate. This is indicated by illumination of the COAST indicator light (B, fig. 104). When the target "pip" reappears in the 100-yard range notch (fig. 123) on the range indicator presentation, the COAST indicator light extinguishes and the missile-tracking radar system continues to automatically track the missile in range. For a detailed explanation of the range indicator presentation, refer to paragraph 90*a*.

c. Missile Azimuth Control. All controls necessary for the operation of the azimuth positioning system of the missile-tracking radar system are on the missile track control drawer (fig. 36). The azimuth to which the track antenna reflector assembly (fig. 50) of the missile tracking radar system is pointing is indicated by the AZIMUTH dial (M, fig. 103) on the missile track indicator (fig. 36). The azimuth positioning system has three modes of operation: manual, aided, or automatic. These three modes of operation are used only when the missile-tracking radar system is in the test condition; automatic operation is always used when the missile-tracking radar system is in normal operation.

(1) *Manual mode.*

(*a*) To operate in this mode the missile-tracking radar system must be in the test condition, and the azimuth MAN-AID-AUTO switch (L, fig. 104) on the missile track control drawer (fig. 36) must be set to the MAN position. The azimuth handwheel (J, fig. 104) is then rotated either clockwise or counterclockwise to position the track antenna reflector assembly (fig. 50) associated with the missile-tracking radar system to the desired azimuth.

(*b*) If the missile-tracking radar system is in the test condition, and the LAUNCHER ACQUIRE switch (C, fig. 104) is operated, the track antenna reflector assembly (fig. 50) automatically slews to the azimuth of the designated missile, or to the guided missile flight simulator if a missile has not been designated.

(2) *Aided mode.* To operate in this mode the missile-tracking radar system must be in the test condition, and the azimuth MAN-AID-AUTO switch (L, fig. 104) must be set to the AID position. When the azimuth MAN-AID-AUTO switch is in the AID position, and the azimuth handwheel (J, fig. 104) is rotated and then released, the azimuth position of the missile, as represented by the azimuth positioning system of the missile-tracking radar system, automatically continues to increase or decrease. The direction and

rate at which the azimuth position continues to increase or decrease remains the same as that of the azimuth handwheel at the time manual rotation was discontinued. The direction and rate continues until the azimuth handwheel is rotated in the opposite direction, or until the azimuth MAN-AID-AUTO switch is set to the MAN or AUTO position.

(3) *Automatic mode*. To operate in this mode the missile-tracking radar system must be in the test condition, and the azimuth MAN-AID-AUTO switch (L, fig. 104) must be set to the AUTO position. With the system in the above condition, the missile-tracking radar system locks on and automatically tracks the missile in azimuth, provided the conditions given in (*a*) and (*b*) below are fulfilled.

(*a*) The missile is presently being tracked in range and elevation in either the manual, aided, or automatic mode.

(*b*) The missile is presently being tracked in azimuth in either the manual or aided mode.

d. Missile Elevation Control. All controls necessary for the operation of the elevation positioning system of the missile-tracking radar system are on the missile track control drawer (fig. 36). The elevation angle to which the track antenna reflector assembly (fig. 50) of the missile track antenna-receiver-transmitter group is pointing is indicated by the ELEVATION dial (S, fig. 103) on the missile track indicator (fig. 36). The elevation positioning system has three modes of operation: manual, aided, and automatic. These three modes of operation are used only when the missile-tracking radar system is in the test condition; automatic operation is always used when the missile-tracking radar system is in normal operation.

(1) *Manual mode*.

(*a*) To operate in this mode the missile-tracking radar system must be in the test condition, and the elevation MAN-AID-AUTO switch (Q, fig. 104) on the missile track control drawer (fig. 36) must be set to the MAN position. The elevation handwheel (N, fig. 104) is then rotated either clockwise or counterclockwise to position the track antenna reflector assembly (fig. 50) associated with the missile-tracking radar system to the desired elevation angle.

(*b*) If the missile-tracking radar system is in the test condition, and the LAUNCHER ACQUIRE switch (C, fig. 104) is operated, the track antenna reflector assembly automatically slews to the elevation angle of the designated missile, or to the guided missile flight simulator if a missile has not been designated.

(2) *Aided mode*. To operate in this mode the missile-tracking radar system must be in the test condition and the elevation MAN-AID-AUTO switch (Q, fig. 104) must be in the AID position. When the elevation MAN-AID-AUTO switch is in the AID position and the elevation handwheel is rotated and then released, the elevation angle of the missile as represented by the elevation positioning system of the missile-tracking radar system automatically continues to increase or decrease. The direction and rate at which the elevation angle continues to increase or decrease remains the same as that of the elevation handwheel at the time manual rotation was discontinued. This direction and rate continues until the elevation MAN-AID-AUTO switch is set to the MAN or AUTO position or until the elevation

handwheel is rotated in the opposite direction.

Caution: **Do not allow the antenna to drive into the antenna elevation stops.**

(3) *Automatic mode.* To operate in this mode the missile-tracking radar system must be in the test condition, and the elevation MAN-AID-AUTO switch (Q, fig. 104) must be set to the AUTO position. With the system in the above condition the missile-tracking radar system locks on and automatically tracks the missile in elevation provided the conditions in (*a*) and (*b*) below are fulfilled.

(*a*) The missile is presently being tracked in range and azimuth in either the manual, aided, or automatic mode.

(*b*) The missile is presently being tracked in elevation in either the manual or aided mode.

e. Missile Selection Control.

(1) *Automatic missile selection.* During normal operation the type missile information corresponding to the setting of the MISSILE switch (GG, 1, fig. 77) and MISSION switch (LL, 1, fig. 77) on the battery signal panel-indicator (fig. 24) on the battery-control console is transmitted to the launching area. The launching area personnel then designate the missile to be fired. Operation of equipment in the launching area is presented in TM 9–5096–1.

(2) *Local missile selection.*

(*a*) During test conditions or emergency conditions the missile-tracking radar system operates in the local mode. Operation under emergency conditions is discussed in paragraphs 120 and 121. To operate in the local mode, the LOCAL DESIGNATE switch (J, fig. 103) on the missile track indicator (fig. 36) must be set to the on (up) position. When the switch is in this position, a launching section can be designated by operating any one of four SECTION switches (U, V, W, or X; fig. 103). The designated section is indicated by illumination of the corresponding SECTION indicator light (Y, Z, AA, or BB; fig. 103). After a section has been designated, a launcher can be designated by operating any one of four LAUNCHER switches (N, P, Q, or R; fig. 103). The launcher designated is indicated by illumination of the corresponding LAUNCHER indicator light (B, C, D, or E; fig. 103).

(*b*) When the missile-tracking radar system is conditioned for local operation and the TEST RESPONDER switch (K, fig. 103) is depressed, the TEST RESPONDER indicator light (G, fig. 103) illuminates. This indicates that the guided missile flight simulator is designated instead of a missile.

(*c*) If the missile-tracking radar system is conditioned for local operation and the computer is conditioned for either action or tracking test (par. 91*b*(1)(*a*), and 91*b*(1)(*c*)) the missile-tracking radar system slews to the azimuth, elevation and range of either the designated missile or the guided missile flight simulator, whichever is designated, when the LAUNCHER ACQUIRE switch (C, fig. 104) on the missile track control drawer (fig. 36) is operated.

f. Magnetron Frequency Control. Magnetron frequency control consists of the operations necessary to establish the desired operating frequency of the magnetron associated with the transmitter system of the missile-tracking radar system. The FREQUENCY switch (C, fig. 105) and the FREQUENCY meter (B, fig. 105) on the missile track control power supply (fig. 36) are used in performing these operations. The FREQUENCY switch, when operated to the INCREASE or DECREASE position, increases or decreases, respectively, the frequency of the magnetron between 8500 and 9600 megacycles. When the FREQUENCY switch is released from either one of these positions, the frequency remains as it was at the time the switch was released. The FREQUENCY meter is graduated from 0 to 100 in increments of 5 representing the relative frequency of the magnetron.

g. *Missile High Voltage Control.* Missile high voltage control consists of the observations that must be made and the operations that must be performed by the operator to apply high voltage to and remove high voltage from the range indicator (fig. 36) on the missile radar control console, and the magnetron of the transmitter system of the missile tracking radar system. The controls and indicator lights used to perform these operations are discussed in (1) and (2) below.

(1) *Indicator high voltage control.* When the IND HV switch (G, fig. 105) on the missile track control power supply (fig. 36) is turned to the on (up) position, high voltage is applied to the range indicator of the missile radar control console. This causes the cathode-ray tube of the range indicator to illuminate, provided the INTENSITY knob (B, fig. 107) on the range indicator is properly adjusted. This also causes the IND HV indicator light (F, fig. 105) on the missile track control power supply (fig. 36) to illuminate.

(2) *Magnetron high voltage control.*

Caution: **Safety devices are built into the magnetron high voltage circuitry to insure proper energization, but these safety devices may fail; therefore, it is necessary that the missile-tracking radar system equipment be energized in the manner prescribed in tables XV, and XVI, in sequence, to prevent damage to or possible failure of the equipment.**

(*a*) When illuminated, the HV SUPPLY-READY indicator light (L, fig. 105) on the missile track control power supply indicates that the necessary time delay has elapsed, and high voltage may be applied to the magnetron of the missile tracking radar system, provided the HV SUPPLY knob (M, fig. 105) is in the START position.

(*b*) When the HV SUPPLY-ON switch (H, fig. 105) is depressed the magnetron is energized, the HV SUPPLY-ON indicator light (J, fig. 105) illumniates and the HV SUPPLY-READY indicator light (L, fig. 105) extinguishes, provided the HV SUPPLY knob is in the START position. After the magnetron is energized, the current of the magnetron is controlled by the HV SUPPLY knob. Turn knob smoothly clockwise from the START position until MAGNETRON meter (A, fig. 105) indicates 8.5 ma for NIKE-HERCULES operation, or 15 ma for NIKE-AJAX operation.

Caution: **Do not force knob beyond mechanical stops. If meter pointer fluctuation is sufficient to actuate the overcurrent sensing device causing the HV SUPPLY-ON indicator light (J, fig. 105) to extinguish, turn knob all the way counterclockwise and notify** an organizational maintenance technician.

Note. To read the average magnetron current, MAGNETRON switch (N, fig. 105) must be in the center position (FS 20MA).

(*c*) The HV SUPPLY knob (M, fig. 105) is rotated counterclockwise to the START position and the HV SUPPLY-OFF switch (K, fig. 105) is depressed to deenergize the magnetron. The HV SUPPLY-READY indicator light (L, fig. 99) illuminates, and the HV SUPPLY-ON indicator light (J, fig. 99) extinguishes.

90 (CMHA). Description of Missile Tracking Radar Presentation

The missile tracking radar presentation indicates missile range, azimuth, and elevation information. The range information is presented by means of a range indicator. The azimuth information is presented by means of an azimuth dial and an azimuth error meter. The elevation information is presented by means of an elevation dial and an elevation error meter.

Note. The term "missile" when used in this paragraph in connection with presentation obtained during testing operations is synonymous with the terms object or target for reasons explained in paragraph 89*a*(2).

a. Range Indicator Presentation. The range indicator presentation is presented by means of a cathode-ray tube and a range dial. One of two types of presentations is presented on the cathode-ray tube. The type is determined by the setting of the IMAGE SPACING switch (E, fig. 107) on the range indicator (fig. 36) on the missile radar control console. The cathode-ray tube presented as selected by the IMAGE SPACING switch is adjusted or varied by three controls on the front of the range indicator.

(1) *Presentation with the IMAGE SPACING switch set to the OFF or NOR position.* The range indicator presentation is identical when the IMAGE SPACING switch (E, fig. 107) is set to either the OFF or NOR position. This presentation is shown on figure 123. The presentation consists of a coder pulse and a transmitted pulse, 500-yard expanded sweep, and the 100-yard range notch, all super-imposed on the baseline. The target "pip" becomes part of the presentation when a radar return signal or a missile transmitted signal is being received by the missile tracking radar system. The range indicator is normally operated with the IMAGE SPACING switch set to the OFF or NOR position.

(*a*) *Baseline.* The baseline (fig. 123) extends across the face of the cathode-ray tube and represents a maximum range of either 200,000 yards or 55,000 yards, depending upon the type missile to be used. The baseline can be adjusted to represent any range between 40,000 and 200,000 yards when the missile tracking radar system is conditioned for a NIKE-HERCULES engagement, or the baseline can be adjusted to represent any range between 10,000 and 55,000 yards when the missile tracking radar system is conditioned for a NIKE-AJAX engagement. The left end of the baseline represents 0 yards in range and the right end represents the maximum adjusted range. Superimposed on the baseline is "grass" (noise) that reduces to a minimum when the missile tracking radar system is locked on the missile.

(*b*) *Transmitted pulse and coder pulse.* When the missile tracking radar system is conditioned for a NIKE-AJAX engagement, the coder pulse (fig. 123) appears as a clearly defined pulse on the left end of the baseline, and the transmitted pulse (fig. 123) appears directly to the right of the coder pulse. When the missile tracking radar system is conditioned for a NIKE-HERCULES engagement, the coder pulse and the transmitted pulse appear defocused and intermixed on the left end of the baseline. The coder pulse indicates that the coder system of the missile tracking radar system is operating. The transmitted pulse represents 0 yards in range and signifies that the missile tracking radar system is transmitting. Neither pulse has any operational significance, but appears only because of inherent characteristics of the missile tracking radar system.

(*c*) *500-yard expanded sweep.* The 500-yard expanded sweep (fig. 123) enlarges a segment of the baseline for better definition of a target "pip". The 500-yard expanded sweep moves left

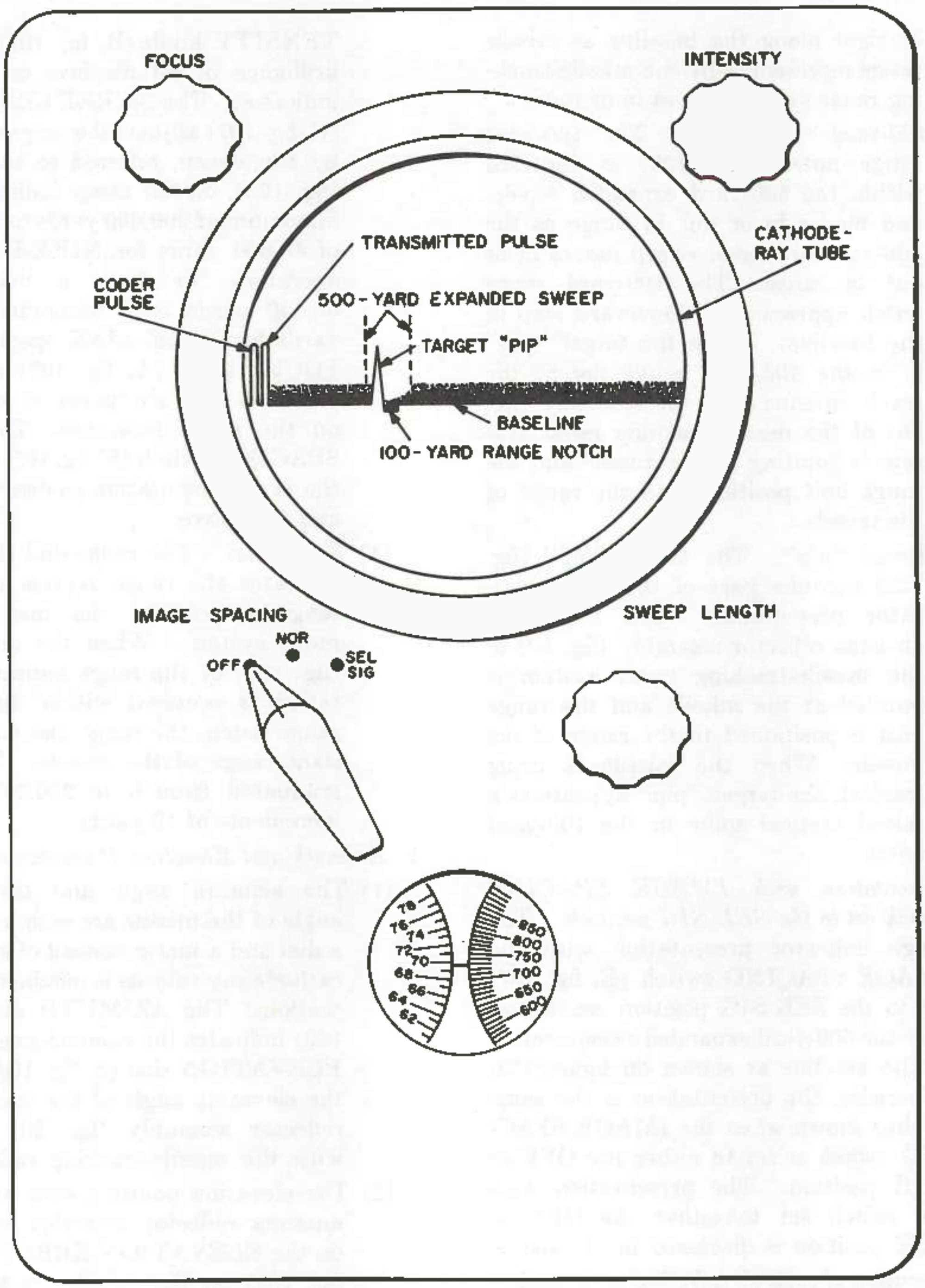


Figure 123. Range indicator (missile radar control console)—presentation—IMAGE SPACING switch set to OFF or NOR position.

or right along the baseline as missile range represented by the missile-tracking radar system moves in or out.

(*d*) *100-yard range notch.* The 100-yard range notch (fig. 123) is centered within the 500-yard expanded sweep, and moves in or out in range as the 500-yard expanded sweep moves in or out in range. The 100-yard range notch appears as a downward step in the baseline. When the target "pip" is in the 100-yard range notch, the track antenna reflector assembly (fig. 50) of the missile-tracking radar system is pointing at the missile and the range unit positioned to the range of the missile.

(*e*) *Target "pip".* The target "pip" (fig. 123) becomes part of the range indicator presentation when the track antenna reflector assembly (fig. 50) of the missile-tracking radar system is pointed at the missile and the range unit is positioned to the range of the missile. When the missile is being tracked, the target "pip" appears as a raised vertical spike in the 100-yard notch.

(2) *Presentation with IMAGE SPACING switch set to the SEL SIG position.* The range indicator presentation with the IMAGE SPACING switch (E, fig. 107) set to the SEL SIG position consists of only the 500-yard expanded sweep section of the baseline as shown on figure 122. Otherwise, the presentation is the same as that shown when the IMAGE SPACING switch is set to either the OFF or NOR position. The presentation with the switch set to either the OFF or NOR position is discussed in (1) above.

(3) *Operation of controls affecting presentation.* The presentation on the range indicator is affected by four controls. The INTENSITY knob (B, fig. 107) varies the brilliance of all displays on the range indicator. The SWEEP LENGTH knob (C, fig. 107) adjusts the range represented by the sweep, referred to as a baseline (fig. 123), on the range indicator from a maximum of 200,000 yards to a minimum of 40,000 yards for NIKE-HERCULES operation; or from a maximum of 55,000 yards to a minimum of 10,000 yards for NIKE-AJAX operation. The FOCUS knob (A, fig. 107) adjusts the clearness and sharpness of all displays on the range indicator. The IMAGE SPACING switch (E, fig. 107) determines the type presentation as described in (1) and (2) above.

(4) *Range dial.* The range dial (D, fig. 107) indicates the range represented by the range system of the missile-tracking radar system. When the target "pip" (fig. 123) of the range indicator presentation is centered within the 100-yard range notch, the range dial indicates the slant range of the missile. The dial is graduated from 0 to 200,000 yards in increments of 10 yards.

b. Azimuth and Elevation Presentation.

(1) The azimuth angle and the elevation angle of the missile are each indicated on a dial and a meter instead of a dial and a cathode-ray tube as is missile range information. The AZIMUTH dial (M, fig. 103) indicates the azimuth angle, and the ELEVATION dial (S, fig. 103) indicates the elevation angle of the track antenna reflector assembly (fig. 50) associated with the missile-tracking radar system.

(2) The elevation pointing error of the track antenna reflector assembly is indicated on the ELEVATION ERROR meter (A, fig. 103) on the missile track indicator (fig. 36). The azimuth pointing error of the track antenna reflector assembly is

indicated on the AZIMUTH ERROR meter (F, fig. 103) on the missile track indicator. The meters are zero centered. An indication either side of zero indicates a pointing error. For example, an indication to the left on the ELEVATION ERROR meter occurs when the track antenna reflector assembly is pointing below the missile.

91. Computing Equipment Control

During a normal engagement, the operation of the computer system is automatic and functionally related to the operation of the target-tracking radar system, missile-tracking radar system, and launching equipment. The target-tracking radar system supplies the computer system with target position information. The missile-tracking radar system supplies the computer system with missile position information. The computer, in turn, supplies steering and burst orders to the missile by way of the missile-tracking radar system. The computer also sends gyro azimuth (A_G) information to the missile prior to firing. The operation of the computer system, as performed by the operator, is automatic except for the following operations that are performed prior to firing; manually setting in data, and performing tests to insure proper operation of the computer system.

a. Description of Dial and Meter Indications.

(1) *CLIMB ANGLE dial and GYRO AZIMUTH dial.*

(*a*) The CLIMB ANGLE dial (E, fig. 85) indicates the climb angle of the missile, and the GYRO AZIMUTH dial (D, fig. 85) indicates the gyro azimuth (A_G) angle of the predicted intercept point. Both dials indicate mils and are identically graduated. Each dial has an upper scale (fig. 124) graduated from 0 to 6400 mils with marks at 100-mil intervals, and numerals at 200-mil intervals. Each dial also has a lower scale graduated from 0 to 100 mils with marks at 5-mil intervals and numerals at 10-mil intervals. The stationary diamond-shaped marking on each dial is the index.

(*b*) To obtain a reading, the individual readings on the two scales must be combined, using the thousand and hundred digit from the upper scale and the ten and unit digit from the lower scale. The upper scale is read by using the mark directly opposite the index. If the index points between two marks, the smaller number is used. The lower scale is read in a similar way, with the exception that if the index points between two marks, the reading must be estimated. Figure 124 shows the CLIMB ANGLE dial set to 6234 mils.

(2) *TIME TO INTERCEPT dial.*

(*a*) The TIME TO INTERCEPT dial (B, fig. 85) indicates in seconds the remaining time to intercept. It has two scales and a vernier. The upper scale (fig. 125) indicates time in seconds and is graduated from 0 to 200 seconds with marks at 1-second intervals, and numerals at 10-second intervals. The lower scale is graduated from 0 to 1 with marks at 0.01-second intervals, and numerals at 0.1-second intervals. The long time at the left of the vernier is an index followed to the right by ten divisions. The vernier is used with the lower scale to determine time in thousandths of seconds.

(*b*) To obtain a reading, the individual reading on both scales and the vernier must be combined. The upper or lower scales are read by using the mark on each scale directly opposite the index. If the index points between two marks, the smaller indication is used. On figure 125 the upper scale

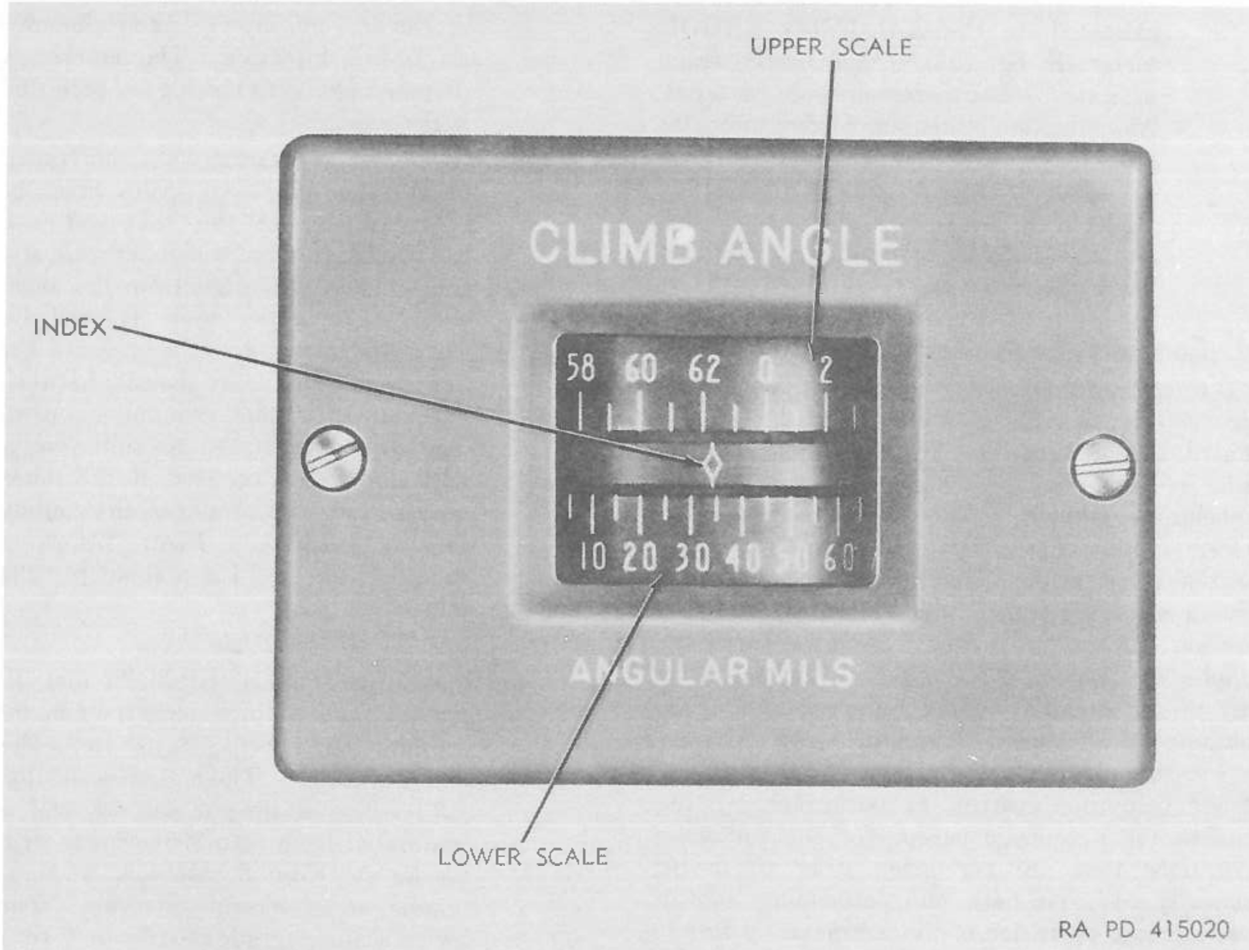


Figure 124. CLIMB ANGLE dial—front view.

indicates 96, and the lower scale indicates 00. The upper and lower scales combined indicate 96.00 seconds remaining until intercept. To obtain the third digit to the right of the decimal point (thousandths), it is necessary to determine which mark on the vernier is in closest alinement with a division on the lower scale. In figure 125 this is the second vernier division; therefore, the complete reading is 96.002 seconds remaining until intercept.

(3) *TURN ANGLE dial and BALLISTIC EL dial.*

(*a*) The TURN ANGLE dial (A, fig. 85) indicates the turn angle of the missile, and the BALLISTIC EL dial (C, fig. 85) indicates the ballistic elevation angle of the predicted intercept point. Both dials indicate mils and are identically graduated. Each dial has an upper scale (fig. 126) graduated from −1600 mils to +1600 mils with marks at 100-mil intervals and numerals at

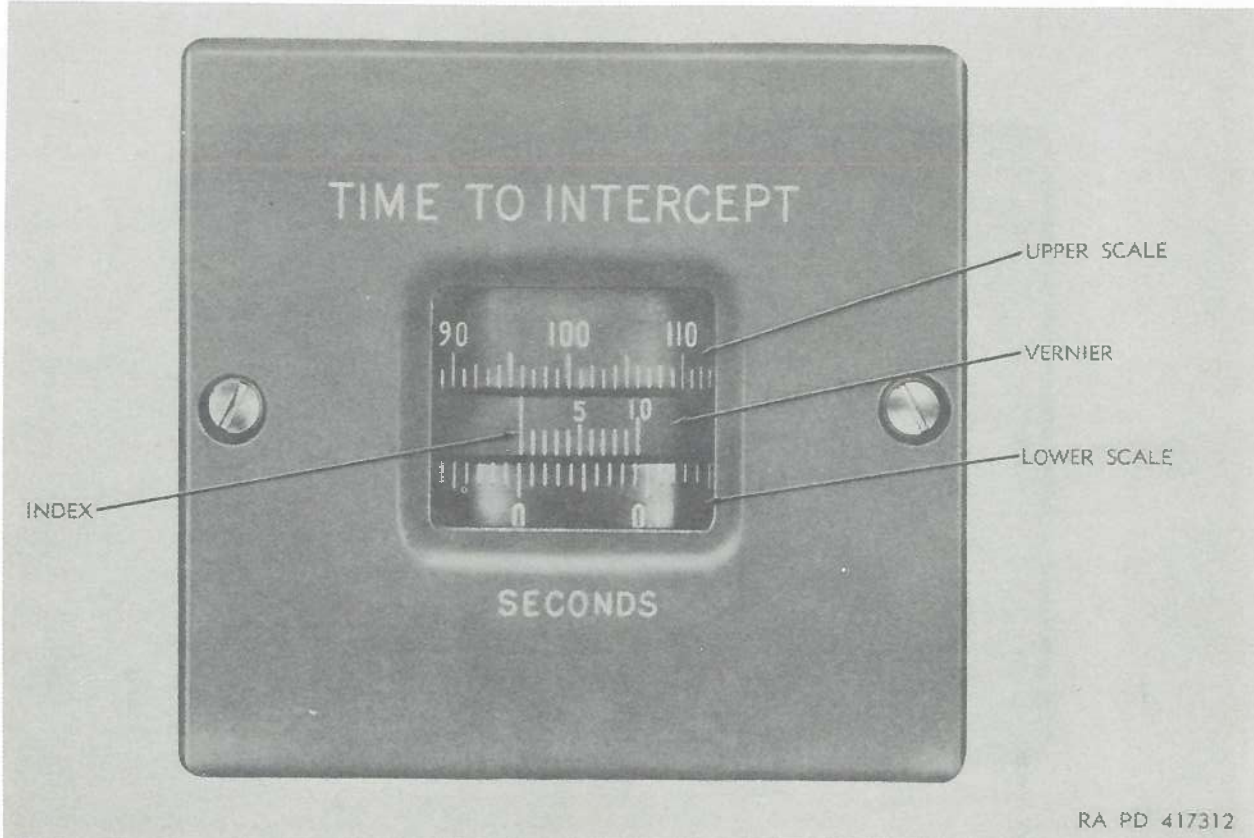


Figure 125. TIME TO INTERCEPT dial—front view.

200-mil intervals; and a lower scale graduated from 0 to 100 with marks at 5-mil intervals and numerals at 10-mil intervals. Values indicated on the black portions of the upper and lower scales to the right of zero are positive; values indicated on the red portion of the upper and lower scales to the left of zero are negative. The stationary diamond-shaped marking on each dial is the index.

(*b*) To obtain a reading, the individual readings of the same color on the two scales must be combined, using the thousand and hundred digit from the lower scale. The upper scale is read by using the mark directly opposite the index. If the index points between two marks, the smaller indication is used. The lower scale is read in a similar way, except that if the index points between two marks, the reading must be estimated. As shown on figure 126, the black portion of the upper scale indicates 100 mils and the black portion of the lower scale indicates 5 mils; therefore, the combined reading of the two scales is 105 mils.

(4) *VELOCITY CORRECTION dial.* The VELOCITY CORRECTION dial (J,

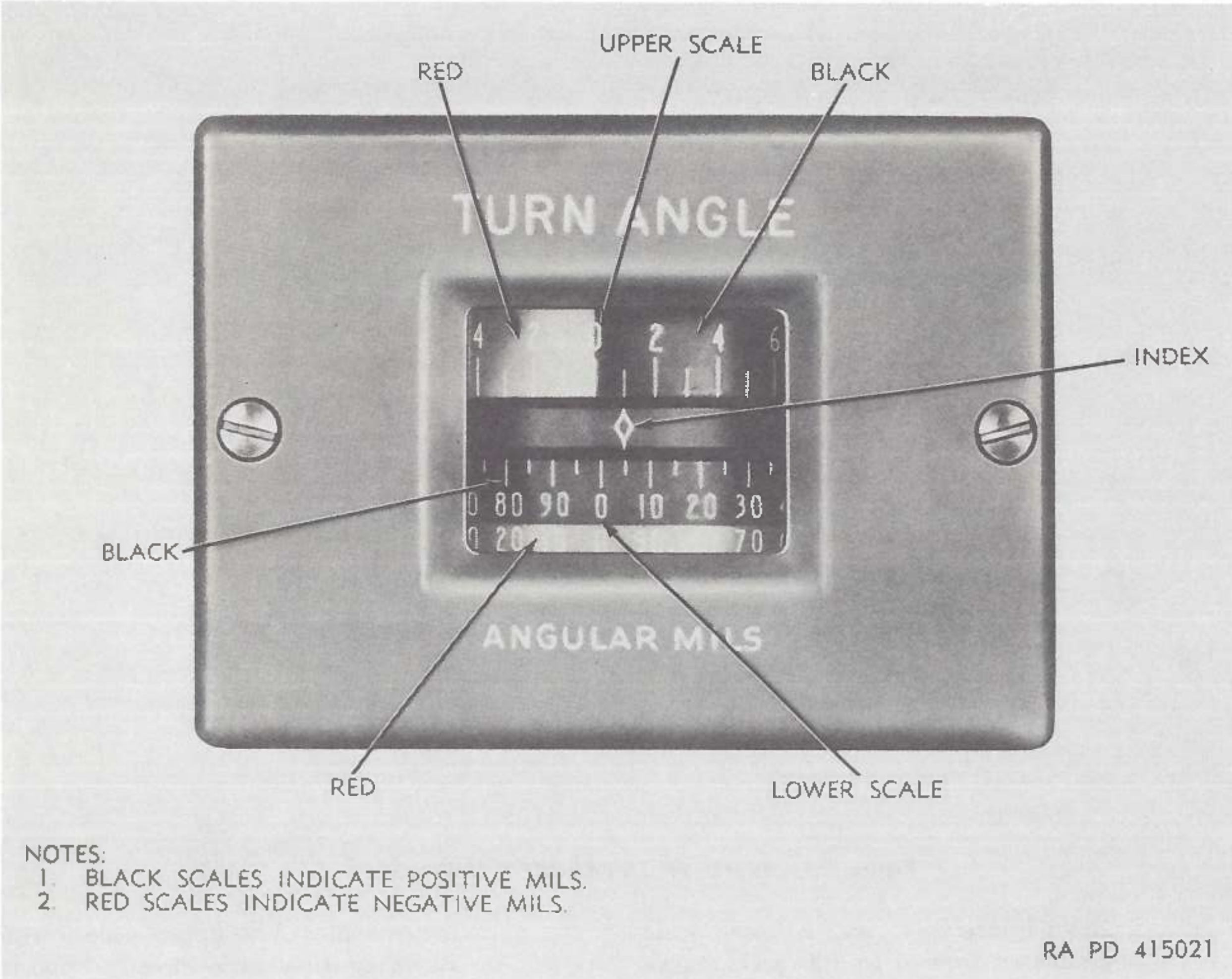


Figure 126. TURN ANGLE dial—front view.

fig. 86) indicates the velocity correction necessary to compensate for the loss of missile speed caused by motor burnout. The dial (fig. 127) is graduated from 0 to 50 percent in increments of 0.2 percent and numerals at every 1.0 percent. The dial is read by using the arrow directly above the 0 on the lower part of the dial. If the arrow points between two marks, the smaller number is used. The VELOCITY CORRECTION dial shown on figure 127 indicates 36 percent.

(5) *TRANSIT TIME dial.*

(*a*) The TRANSIT TIME dial (K, fig. 86) indicates the time it takes, after missile warhead detonation, for the warhead destructive force to reach its maximum radius. The dial (fig. 128) has a scale and a vernier. The scale

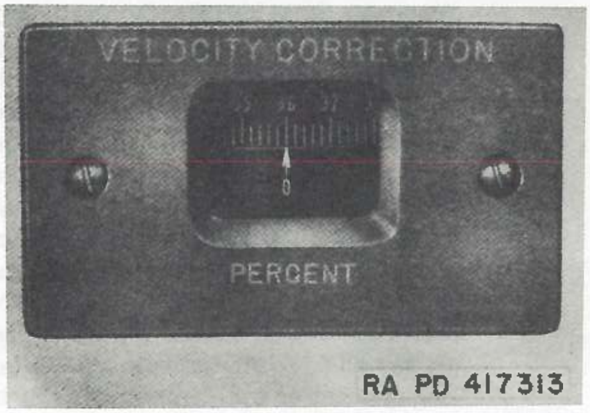


Figure 127 (CMHA). VELOCITY CORRECTION dial—front view.

is graduated from 0 to 16 seconds with marks every 0.1 second and numerals every 0.5 second. The 0 and arrow at the left of the vernier serve as an index followed to the right by 10 divisions. The vernier is used with the scale to determine transit time in hundredths of a second.

(*b*) To obtain a reading, the individual readings on the scale and the vernier must be combined. The scale is read by using the mark that is directly opposite the index. On figure 128 the scale indicates 0.2. The vernier is read by determining which mark on the vernier is in closest alinement with a division on the scale. On figure 128 this is the tenth mark; therefore, the complete reading is still 0.2 second.

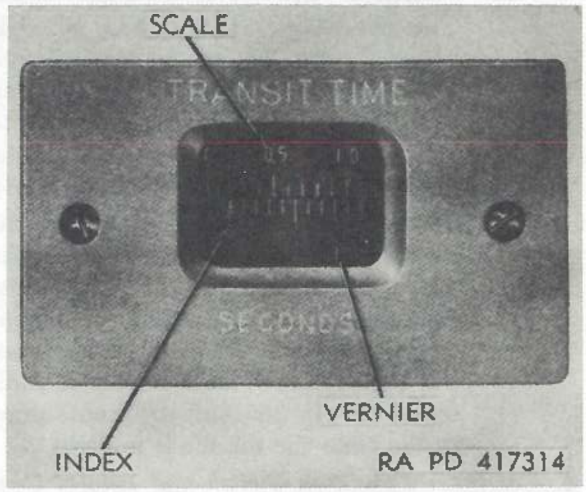


Figure 128 (CMHA). TRANSIT TIME dial—front view.

(6) ***PRESENT TARGET ALTITUDE meter***. The PRESENT TARGET ALTITUDE meter (E, 1, fig. 78) on the tactical control-indicator (fig. 24) indicates the present altitude of the target being tracked. The meter is graduated from 0 to 100,000 in increments of 1 foot.

(7) ***GYRO AZIMUTH indicator***. The GYRO AZIMUTH indicator (L, 1, fig. 78) on the tactical control-indicator (fig. 24) indicates the gyro azimuth (A_G) angle of the predicted intercept point. The meter is graduate from O to 6400 in increments of 5 mils.

(8) ***TARGET GROUND SPEED meter and MISSILE SPEED meter.***

(*a*) *TARGET GROUND SPEED meter.* The TARGET GROUND SPEED meter (D, fig. 78) on the tactical control-indicator indicates the ground speed of the tracked target from 0 to 1500 knots in increments of 100 knots.

(*b*) *MISSILE SPEED meter.* The MISSILE SPEED meter (F, fig. 78) on the tactical control-indicator indicates the missile air speed from 0 to 3000 knots in increments of 100 knots. Inherent characteristics of the equipment cause the MISSILE SPEED meter to indicate between 350 and 410 knots prior to the time the missile is in flight.

b. Computer Condition Switch and Related Controls and Indicators.

(1) The COMPUTER CONDITION switch (PP, fig. 84) on the computer control-panel (fig. 28) is a five-position rotary switch which permits selection of the type of operation to be performed by the computer system. The five positions of the switch are: ACTION, STANDBY, TRACKING, STEERING, and PRE-LAUNCH & INITIAL TURN.

(*a*) When the COMPUTER CONDITION switch is set to the ACTION position, the computer system is fully energized and conditioned for an engagement or for performance of certain dynamic checks. For a discussion of these checks refer to TM 9-1430-251-12. During an actual engagement, with the COMPUTER CONDITION switch in the ACTION position, the computer system starts to solve the fire control problem as soon as the TRACKED switch (H, fig. 96) on the target track control drawer (fig. 34) is depressed, indicating that the target-tracking radar system is tracking the target in azimuth, elevation, and range.

(*b*) When the COMPUTER CONDITION switch is set to the STANDBY position, the computer system is partially energized and is in a state of readiness. This state of readiness permits partial operation of certain computer system components, thereby reducing wear, and yet requires minimum time to condition the computer system for an engagement. The COMPUTER CONDITION switch should always be set to the STANDBY position unless an engagement or test demands that it be set to some other position.

(*c*) When the COMPUTER CONDITION switch is set to the TRACKING position, the computer system is partially energized and is conditioned for performance of certain periodic checks. For a discussion of these checks refer to TM 9-1430-251-12. In this condition the computer system receives position information from the target-tracking radar system and from the missile-tracking radar system.

(*d*) When the COMPUTER CONDITION switch is set to the STEERING position, the computer system is partially energized and is conditioned to check the operation of the steering section of the computer system, using eight built-in static test problems. For a discussion of these static test problems, refer to TM 9-1430-251-12. When the COMPUTER CONDITION switch is in the STEERING position the desired static test problem may be introduced into the computer system by rotating the STATIC TEST-STEERING switch (H, fig. 84) on the computer control-panel (fig. 28) to the position corresponding to the problem desired.

(e) When the COMPUTER CONDITION switch is set to the PRE-LAUNCH & INITIAL TURN position, the computer system is partially energized and is conditioned to check operation of the prelaunch and initial turn sections of the computer system, using the eight built-in static test problems. The switch is also set to this position to perform certain altitude plotting board (fig. 24) and horizontal plotting board checks and adjustments. For a discussion of the built-in static test problems, and the plotting board checks and adjustments, refer to TM 9-1430-251-12. The eight problems are introduced into the prelaunch and initial turn sections by using the STATIC TEST—PRE-LAUNCH & INITIAL TURN switch (L, fig. 84) on the computer control-panel (fig. 28).

(2) The settings of the COMPUTER CONDITION switch and of the TARGET MISSILE switch determine the type of information displayed on the ACCELERATION, VELOCITY AND POSITION DIFFERENCE-H, G_T meter (V, fig. 84), ACCELERATION, VELOCITY AND POSITION DIFFERENCE-X, G_Y meter (P, fig. 84), and ACCELERATION, VELOCITY AND POSITION DIFFERENCE-Y, G_P meter (S, fig. 84). The information displayed on these meters is used in checking the performance of the computer system. For a discussion of these checks refer to TM 9-1430-251-12.

c. *Manually Set-In Data Dials.*

(1) *Parallax controls and dials.* The parallax knobs (D, G, K, N, R, U, and X, fig. 84) and the parallax dials (C, F, J, M, Q, T, and W, fig. 84) on the computer control-panel adjust and indicate, respectively, the distance in yards the missile track antenna-receiver-transmitter group and the center of the launching area are from the target track antenna-receiver-transmitter group. The parallax circuitry associated with these knobs electrically positions the missile track antenna-receiver-transmitter group and the launching area to the same coordinates as the target track antenna-receiver-transmitter group. The parallax dials must be set to the values listed on the PARALLAX DATA RECORD plate (QQ, fig. 84) on the computer control-panel for the NIKE-HERCULES System to operate properly during an engagement.

(2) *Burst time bias control and dial.* The BUR TIME BIAS knob (C, fig. 86) and the BUR TIME BIAS dial (D, fig. 86) behind the computer control-panel (fig. 28) adjust and indicate, respectively the time before computed intercept at which the computer system must issue the burst order. The burst order must be issued at a predetermined time to overcome fixed delays inherent in the computer system, the missile-tracking radar system, and the missile. The BUR TIME BIAS dial is graduated from 0 to 200 milliseconds in increments of 2 milliseconds.

(3) *Height of site control and dial.* To avoid instability of the missile at high altitudes, the NIKE-HERCULES System must have a means of determining missile altitude so that the G_Y and G_P fin orders sent to the missile can be altered to fit the particular situation. The HT OF SITE knob (A, fig. 86) behind the computer-control panel (fig. 28) can be electrically adjusted to represent the altitude of the target-tracking radar system above mean sea level. From this reference the computer system alters

the fin orders. The HT OF SITE dial (B, fig. 86) indicates the setting of the HT OF SITE knob from 0 to 6000 feet increments of 100 feet.

(4) *Final dive time control and dial and height displace control and dial.* The FINAL DIVE TIME knob (E, fig. 86), FINAL DIVE TIME dial (F, fig. 86), HT DISPLACE knob (G, fig. 86), and the HT DISPLACE dial (H, fig. 86) are discussed in paragraph 114.

d. Computer-Overload Indicator Lights. A bank of 10 AMPLIFIER UNBALANCE indicator lights (CC through MM, fig. 84) on the computer-control panel (fig. 28) flicker when power is applied to the computer system, but should extinguish shortly thereafter. Steady illumination or continued flickering of one or more of these indicator lights indicates trouble in the associated amplifier group. The COMPUTER-OVERLOAD indicator light (N, 1, fig. 78) on the tactical control-indicator (fig. 24) of the battery-control console illuminates or flickers constantly when trouble exists in any one or more of the computer amplifier groups. If trouble is indicated an organizational-maintenance technician should be notified.

92. Plotting Board Equipment Control

The horizontal plotting board (fig. 24) and the altitude plotting board are electromechanical devices which automatically plot target and missile and intercept point position data on paper. The paper is contained in a roll at the left of each plotting board. Before operating, check both plotting boards for clean recording paper. If paper is not clean, clean paper should be pulled over transparent plastic backboard of each plotting board (figs. 129 and 130). Illumination from behind each backboard makes the grid markings visible through the paper. Each plotting board is equipped with electrically controlled right and left plotting pens which plot traces on the paper during an engagement.

a. Horizontal Plotting Board Presentation.

(1) The horizontal plotting board (fig. 24) provides a means for automatically plotting a plan view of the azimuth and range of the target and missile throughout the entire engagement. The backboard of the horizontal plotting board (fig. 129) is marked with 20 concentric circles, representing twenty 10,000-yard range circles, and 32 radial lines indicating azimuth. The twenty 10,000-yard circles extend from zero range at the center to 200,000 yards at the outer circle. The range circles are numerically graduated from 0 to 200, with every fifth circle numbered. Each radial line represents 200 mils in azimuth, and every other line is numbered. The origin of the range and azimuth coordinates displayed by the horizontal plotting board represents the location of the target track antenna-receiver-transmitter group (fig. 49). One pen of the horizontal plotting board (fig. 129) plots the target position throughout the engagement. The other pen plots the predicted intercept point during the prelaunch phase, and thereafter plots the missile position. If the pens touch each other an interchange feature causes the pen which is plotting target data to begin plotting missile data, and the pen which is plotting missile data to begin plotting target data.

(2) A typical engagement plot by the horizontal plotting board is displayed on figure 129. The display is inked on paper and contains three plots: a plot showing the predicted intercept point (point A to point E); and a plot showing present position of the missile (point D to point C). Timing marks appear on each plot at approximately 10-second intervals. TARGET-MISSILE plot

indicators at the lower left and right corners of the board indicate whether the corresponding pen is plotting target position or missile position information.

(3) During the prelaunch phase, the horizontal plotting board continuously plots the present position of the target (point B to the fire mark) and the position of the predicted intercept point (point A to point E). Location of the predicted intercept point is based on the assumption of an immediate fire.

(4) When the fire order was transmitted, the target was at approximately 135,000 yards, and the predicted intercept point was at approximately 95,000 yards. The fire mark appears at about 135,000 yards and 95,000 yards as a short mark to the right of the trace. When the fire order was transmitted, the recorder pen plotting the predicted intercept point returned to approximately the center of the plotting board (point D) and began to plot the position of the missile in the horizontal plane. Target and missile plots continued until target interception occurred at the intersection of the two plots (point C).

b. Altitude Plotting Board Presentation.

(1) The altitude plotting board (fig. 24) provides means for automatically plotting target and missile altitude data against time-to-intercept data. The altitude plotting board (fig. 130) is equally divided into two separate surfaces. The MISSILE (left) plotting surface, graduated from 0 to 200 (center to left), represents time-to-intercept in seconds. The TARGET (right) plotting surface, graduated from 0 to 200 (center to right), represents time-to-intercept in seconds. The vertical distance represents height from 0 to 100,000 feet positive altitude and 0 to 5000 feet negative altitude. Each plotting surface has ten horizontal lines and five vertical lines. Each of the 10 horizontal lines represents 10,000 feet in altitude; each of the vertical lines represents 40 seconds of time-to-intercept. Positions of points which lie between the lines must be estimated. Engraved on the transparent plastic backboard is a curved line which represents the dead zone for the NIKE-HERCULES System. This curved line is shown as part of the TARGET plotting surface on the altitude plotting board. Also engraved on the TARGET plotting surface is a line which extends from the right side of the dead zone to the outer edge of the TARGET plotting surface. This line represents the suggested minimum altitude for a normal surface-to-air engagement, or the suggested upper altitude for a surface-to-air low altitude engagement.

(2) A typical engagement plot by the altitude plotting board is displayed on figure 130. The display shows three plots in the vertical plane: plot of the altitude of the predicted intercept point by the right plotting pen before fire (point C to fire mark, fig. 130); plot of the altitude of the target by the right plotting pen after fire (fire mark to point B); and plot of the altitude of the missile by the left plotting pen before and shortly after fire (point E to point A). Both pens also simultaneously plot time-to-intercept along the horizontal axis. Timing marks appear on each plot at approximately 10-second intervals.

(3) When the target entered the defended area (point C), the altitude of the predicted intercept point was approximately 53,000 feet, as shown on figure 130. The plot of the predicted intercept point continued until the time-to-intercept decreased to approximately 125 seconds.

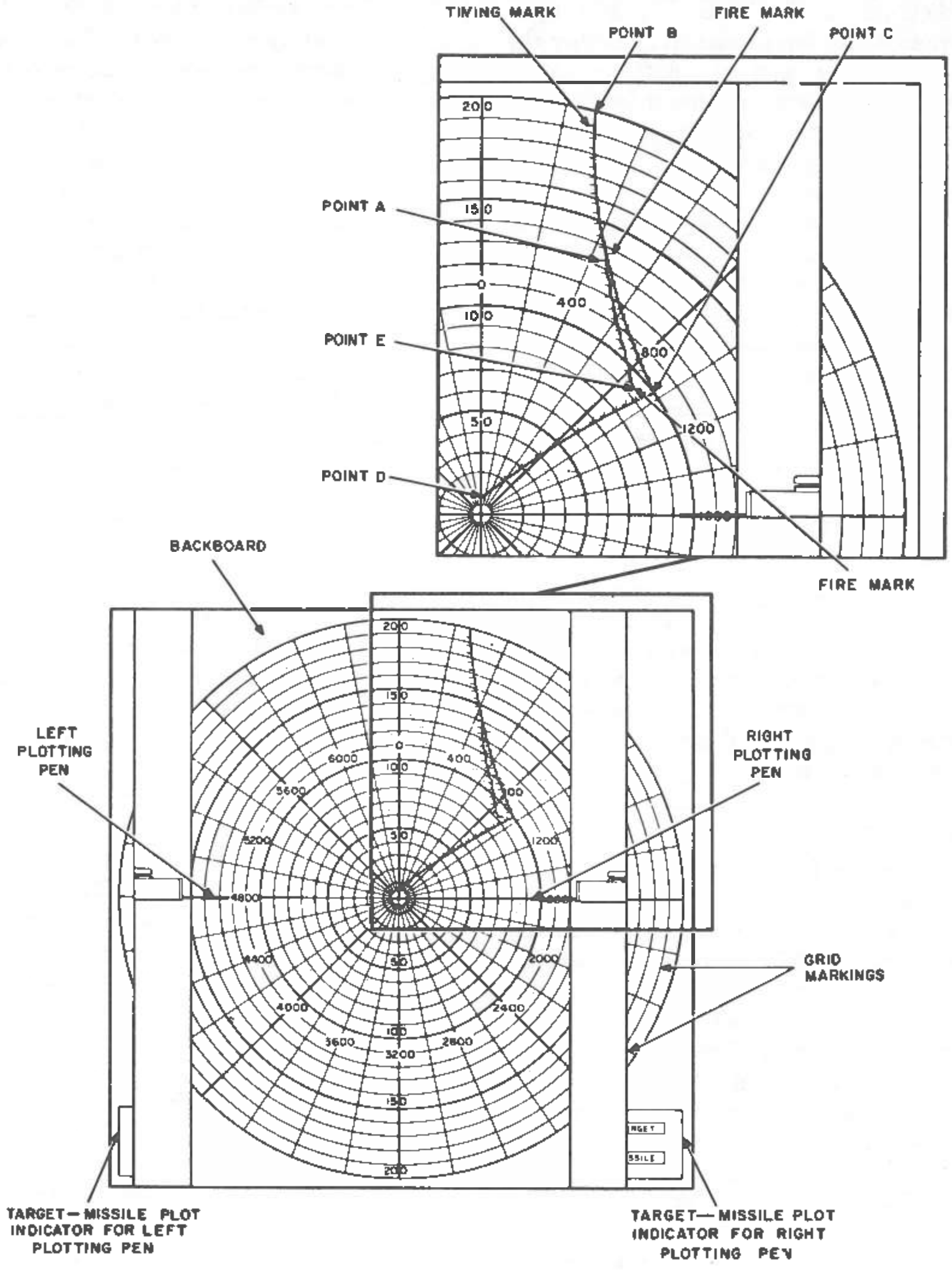


Figure 129. Horizontal plotting board—engagement plot—typical.

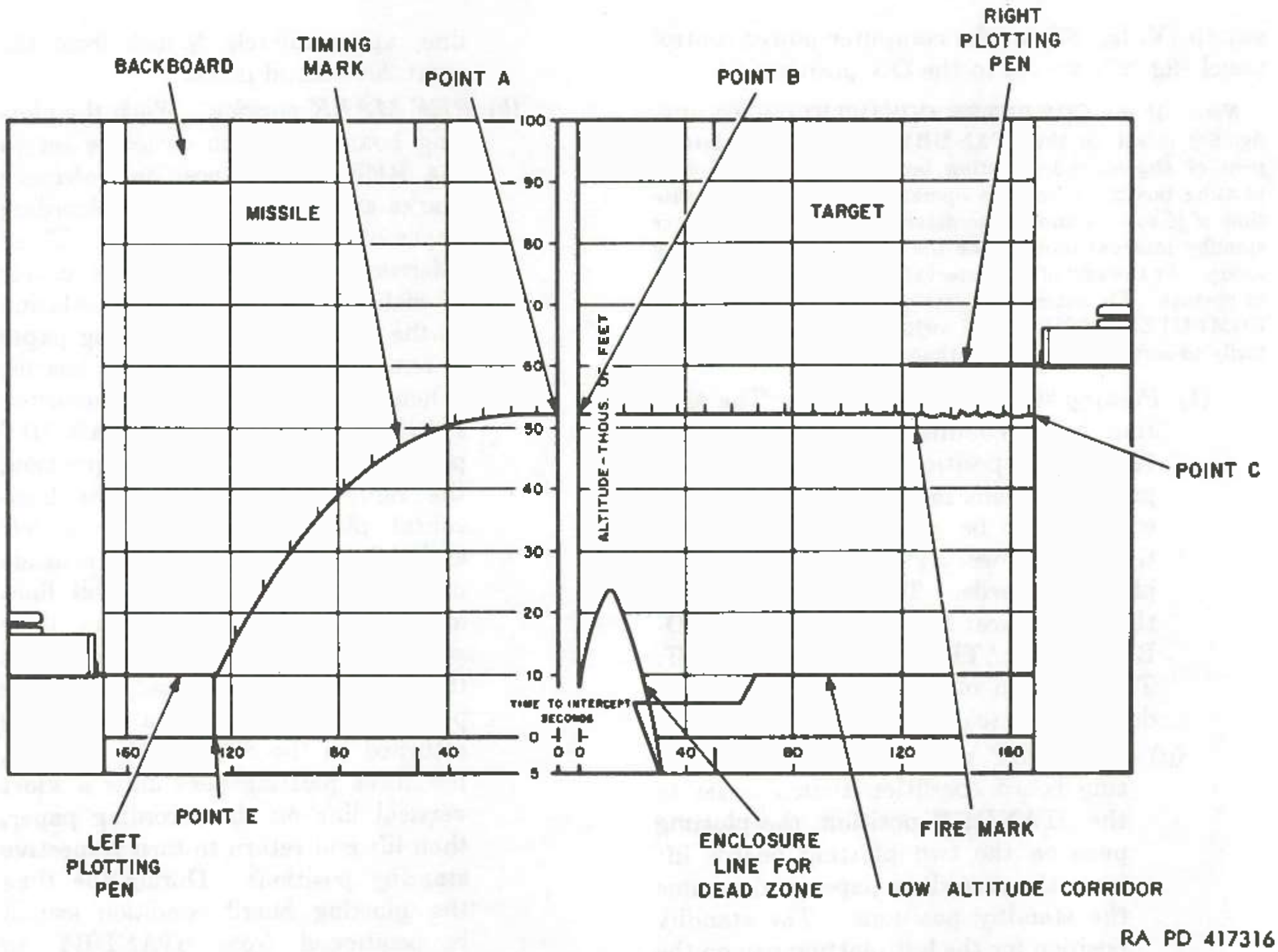


Figure 130. Altitude plotting board—engagement plot—typical.

At this time the fire order was issued as shown by the fire mark on the plot. Shortly thereafter, the right plotting pen started to plot present target altitude against time-to-intercept. The left pen shortly after fire (point E) started to plot missile altitude against time-to-intercept. As time-to-intercept decreased, the two plots moved closer together. At zero time-to-intercept, or burst, the missile and target altitude were coincident (points A and B).

c. Operation of Controls Affecting Plotting Board Operation. The plotting pens of the horizontal plotting board (fig. 129) and the altitude plotting board (fig. 130) are controlled by the plotting board condition switch (G, 2, fig. 78), the PEN LIFT switch (H, 2, fig. 78) and the PEN INTERCHANGE swit h (F, 2, fig. 78) on the tactical control-indicator (fig. 24). Power is applied to the plotting board circuits when the COMPUTER POWER switch (Z, fig. 83), PLATE VOLTS switch (X, fig. 83), and SERVO DC switch (V, fig. 83) on the computer power control panel (fig. 27) are set to the ON position.

Note. If the COMPUTER CONDITION switch (PP, fig. 84) is set to the STANDBY position, the plotting pens of the altitude plotting board and the horizontal plotting board continue to operate for an indeterminate time of ½ to 10½ minutes as determined by the computer standby interval timer inside the computer power supply group. At the end of this interval, the plotting pens cease to operate. To restore the plotting pens to operation, the COMPUTER CONDITION switch must be set momentarily to some position other than STANDBY.

(1) *Plotting board condition switch.* The plotting board condition switch (G, 2, fig. 78) is a five-position rotary switch which provides means for selecting the type of operation to be performed by the plotting pens (figs. 129 and 130) of both plotting boards. The five positions of the switch are: REF MARK, STANDBY, OPERATE, PLOT, and TEST. The function of each switch position is described in (*a*) through (*e*) below.

(*a*) *STANDBY position.* When the plotting board condition switch is set to the STANDBY position, the plotting pens on the two plotting boards lift from the recording paper and assume the standby positions. The standby position for the left plotting pen on the horizontal plotting board (fig. 129) is on the 4800-mils azimuth line, approximately 1 inch inside the 200,000-yard circle. The standby position for the right plotting pen of the horizontal plotting board is on the 1600-mils azimuth line, approximately 1 inch inside the 200,000-yard circle. The standby position for the left plotting board (fig. 130) is on the zero altitude line, approximately ½ inch from the left 200-second mark; for the right plotting pen of the altitude plotting board the standby position is on the zero altitude line, approximately ½ inch from the right 200-second mark.

(*b*) *REF MARK position.* When the plotting board condition switch is set to the REF MARK position, reference marks are produced on the recording paper of both plotting boards. These reference marks establish the center of each plot, and facilitate orientation of the plots after the recording paper is removed from the plotting boards. When the plotting board condition switch is turned from the STANDBY postion to the REF MARK position, the right plotting pen of the horizontal plotting board and the left and right plotting pens of the altitude plotting board draw horizontal lines on the recording paper from their standby positions to the center of their respective coordinates. When the plotting board condition switch is returned to the STANDBY position, the three plotting pens draw a short vertical line on the recording paper, then lift and return to their respective standby positions. During the time the plotting board condition switch is positioned from STANDBY to REF MARK to STANDBY operation, the left plotting pen of the horizontal plotting board remains at its standby position.

(*c*) *PLOT position.* When the computer condition switch (PP, fig. 84) is set to ACTION and the plotting board condition switch is set to the PLOT position, the plotting pens on both plotting boards produce an ink plot of the present computed target position, and of either the predicted intercept point or present missile position. These plots are discussed in *1* through *4* below.

1. The position of one plotting pen of the horizontal plotting board indicates the present azimuth and range position of the target, but the pen remains lifted from the recording paper until the target-tracked signal is received by the computer system. The pen then drops to the paper and plots the present azimuth and range of the target.

2. Four seconds after the target-tracked signal is received, the other plotting pen of the horizontal plotting board drops to the recording paper and begins to plot the azimuth and range of the predicted intercept point. Simultaneously, the right plotting pen of the altitude plotting board drops to the recording paper and begins to plot the altitude, in feet, of the predicted intercept point against time-to-intercept in seconds.

3. The left plotting pen of the altitude plotting board remains lifted but indicates the time-to-intercept in seconds while moving horizontally along the zero altitude line.

4. Approximately 3 seconds after the fire order is issued, the missile away circuits are energized, causing the left plotting pen of the altitude plotting board to drop and begin plotting the altitude in feet, of the missile, against time-to-intercept in seconds. At the same time the right plotting pen of the altitude plotting board stops plotting the altitude of the predicted intercept point and begins to plot the present altitude, in feet, of the target against time-to-intercept in seconds. One plotting pen of the horizontal plotting board continues to plot the range and azimuth of the target, and the other plotting pen of the horizontal plotting board stops plotting the range and azimuth of the predicted intercept point, and begins to plot the range and azimuth of the missile.

(*d*) *OPERATE position.* When the plotting board condition switch is set to the OPERATE position, the plotting pens of both plotting boards remain lifted from the plotting surface, but indicate the same coordinates that are plotted when the plotting board condition switch is set to the PLOT position.

(*e*) *TEST position.* When the plotting board condition switch is set to the TEST position, the magnets of all four plotting pens are energized. This causes the plotting pens to drop to the surface of the recording paper, and permits a check of the magnet circuits of the plotting pens. The plotting board condition switch is generally set to the TEST position when the computer is conditioned for a test.

(2) *PEN LIFT switch.* When operated, the PEN LIFT switch (H, 2, fig. 78) causes the plotting pens on both the altitude plotting board and the horizontal plotting board to lift from the recording paper. The plotting pens are lifted to indicate a point of interest during an engagement, or to prevent the pens from tearing the recording paper. Lifting the pens results in discontinuity of the plot. The PEN LIFT switch functions only when the plotting board condition switch (G, 2, fig. 78) is set to the PLOT position.

(3) *PEN INTERCHANGE switch.* The PEN INTERCHANGE switch (F, 2, fig. 78) interchanges the input data to the plotting pens of the horizontal

plotting board provided the COMPUTER CONDITION switch (PP, fig. 84) is set to the PRE-LAUNCH & INITIAL TURN position. The PEN INTERCHANGE switch is used primarily to check pen interchange circuitry. The plotting pens interchange automatically when the plotting pens or plotting arms touch each other during normal operation. This automatic pen-interchange feature enables the horizontal plotting board to make a continuous plot in all directions.

93. Early Warning Plotting Board

For information concerning the use of the early warning plotting board (fig. 25), refer to paragraph 33*a*.

Section II. RECORDING, COOLING, LIGHTING AND HEATING EQUIPMENT, AND RADAR TEST SET TS-847A/MSW-1

94. Scope

This section groups functionally related front panel controls and indicators of the recording equipment, cooling equipment, lighting equipment, and radar test set TS-847A/MSW-1, of the radar course directing central. Each functional group is separately discussed.

95. Recording Equipment Control

a. General Operation of the Multichannel Data Recorder.

(1) The multichannel data recorder (fig. 23) produces a permanent record on light-sensitive paper, or film, by photographing light traces. For a detailed explanation of the information recorded by the multichannel data recorder, refer to TM 9-1430-250-20/3.

(2) The operation of the multichannel data recorder, as performed by the operator, is restricted to loading, selecting the mode of operation, energizing and de-energizing, and removing the record. The procedure to be followed in loading or removing a record from the multichannel data recorder is discussed in paragraph 128. The three modes of operation, signal-recording mode, alternate signal-recording mode, and test mode, are discussed in *b* through *d* below.

b. Signal-Recording Mode. The signal-recording mode of operation is used at all times except when tests are being performed on the multichannel data recorder, or when the multichannel data recorder is used during an equipment status other than red. To operate in this mode the OPERATE-TEST switch (N, fig. 72) must be set to the OPERATE position. The multichannel data recorder is then energized by the signal-recording method, given in table VIII.

(1) When operating in this mode, the multichannel data recorder starts recording as soon as the equipment status switch (U, 1, fig. 78) on the tactical control-indicator (fig. 24) is set to the RED position and a target has been designated. When the recording starts, the events in (*a*) through (*d*) below occur providing target has been designated.

(*a*) Sixteen galvanometer traces, in the form of red dots, appear on the direct trace monitoring screen (A, fig. 72).

(*b*) The LAMP FAILURE-T indicator light (F, fig. 72), LAMP FAILURE-1 indicator light (G, fig. 72), and the LAMP FAILURE-2 indicator light (H, fig. 72) illuminate to a faint glow.

Note. If one or more LAMP FAILURE indicator lights illuminate at a higher brilliance, it indicates that the corresponding recorder lamp has failed. When this occurs, the organizational-maintenance technician should be notified.

(c) The REC ON indicator light (A, fig. 73) on the fuse and control panel (fig. 23) illuminates.

(d) The MOTOR ON indicator light (L, fig. 72) illuminates, and the RECORD NUMBER counter (B, fig. 72) advances one consecutive number. Both occur approximately 3 seconds after red equipment status and target designated is established.

(2) If, during operation, it is desired to produce a zero trace on the recording paper, the GALVANOMETER ZERO switch (C, fig. 72) should be momentarily depressed. This removes all input signals from the multichannel data recorder and produces a zero reference trace on the record.

(3) The END OF PAPER indicator light (B, fig. 73) on the fuse and control panel (fig. 23) should periodically be observed. This indicator light illuminates when 25 feet or less of recording paper remains on the supply drum (fig. 23).

Note. If the END OF PAPER indicator light (B, fig. 73) illuminates while a record is being made, operation of the recorder may be continued until the end of the engagement.

(4) At the end of the recording period, the record is removed from the multichannel data recorder, and forwarded for photographic processing.

c. Alternate Signal-Recording Mode. The alternate signal-recording mode is used only when the multichannel data recorder is operated during equipment status other than red. The only differences between the alternate signal-recording mode, and the signal-recording mode, discussed in (1) above, are given in (1) and (2) below.

(1) During the alternate signal-recording mode, the OPERATE-TEST switch (N, fig. 72) is set to the TEST position instead of the OPERATE position.

(2) The multichannel data recorder is energized by the alternate signal-recording method, given in table IX.

d. Test Mode. The test mode of operation is used when making calibration checks and adjustments on the multichannel data recorder. To operate in this mode, the multichannel data recorder is energized as given in table X. For calibration checks and adjustments on the multi-channel data recorder, refer to TM 9-1430-251-12.

96. (U). Cooling Equipment Control

Note. Operation of the equipment cooling system in the trailer mounted director station is identical to the operation of the equipment cooling system in the trailer mounted tracking station except for the location of the EQPT VENT switch (*a* below) and differences in warning panels (*c* and *d* below).

The equipment cooling equipment provides filtered air for the electron tubes and other circuit components contained in the trailer-mounted director station. The equipment cooling fan (fig. 18) forces the air through ducts to the cabinets and consoles. The fan consists of two "squirrel cage" blowers, which are driven by a 400-cycle motor.

a. EQPT VENT Switch.

(1) The EQPT VENT switch (B, fig. 71) on the rear of the acquisition power control panel is used to control the application of power to the equipment cooling system in the trailer-mounted director station. Normally the EQPT VENT switch is left in the on (up) position, permitting application of power to the equipment cooling system to be controlled by the MAIN POWER switch (GG, fig. 70) on the front of the acquisition power control panel (fig. 19).

(2) The EQPT VENT switch (A, fig. 90) on the rear of the radar power control panel is used to control the application of power to the equipment cooling system in the trailer-mounted tracking station. Normally, the EQPT VENT switch is left in the on (up) position, permitting application of power to the equipment cooling system to be controlled by the MAIN POWER switch (R, fig. 88) on the front of the radar power control panel (fig. 33).

b. Damper and Shutter Lever. The damper and shutter lever (D, fig. 69) is used to control the air intake and exhaust from the equipment cooling equipment. The damper and shutter lever should be positioned as discussed in (1) through (3) below.

(1) When outside temperature is above 75° F. (Fahrenheit); the damper and shutter lever should be set to the OPEN position.

(2) When the outside temperature is below 75° F., the damper and shutter lever should be adjusted until approximately 75° F. is maintained as indicated on the EXHAUST TEMPERATURE meter (B, fig. 69).

(3) In very cold climates, the damper and shutter lever should be set to the CLOSE position until the EXHAUST TEMPERATURE meter indicates 75° F. The damper and shutter lever should then be adjusted to maintain an exhaust air temperature of approximately 75° F.

c. Warning Panel.

(1) The EXHAUST TEMPERATURE meter (B, fig. 69), the buzzer switch (C, fig. 69), the overheat indicator light (E, fig. 69), and the OPERATING INSTRUCTIONS plate (A, fig. 69) are on the warning panel (fig. 18) and are used with the damper and shutter lever (D, fig. 69) to maintain the exhaust air temperature at a safe operating level below 130° F. The OPERATING INSTRUCTIONS plate gives instructions for setting the damper and shutter lever, for filter replacement, and explains the operation of the exhaust air overheat alarm.

(2) When the indication of the EXHAUST TEMPERATURE meter on the warning panel rises to 140° F. the overheat indicator light illuminates and a warning buzzer sounds. This signals that the radar or computing equipment is overheated and the damper and shutter lever should be set to the OPEN position. The warning buzzer is disabled by operating the buzzer switch. The overheat indicator light remains illuminated until the temperature drops to 130° F.

***Warning:* Do not allow temperature to rise above 130° F. If warning buzzer sounds and overheat indicator light illuminates, set damper and shutter lever to the open position. Under these conditions, only emergency operation of the equipment should be continued.**

Note. The key numbers shown in *d* below refer to figure 86.2 unless otherwise indicated.

d. Warning Panel (Tracking Station Trailer-Systems 1383 and above).

***Caution:* Do not allow temperature to rise above 130° F. If the warning buzzer sounds or any of the overheat indicator lights (5, 6, or 7) illuminates, set damper and shutter lever (4) to OPEN. Under these conditions, only emergency operation of the equipment should be continued.**

(1) The EXHAUST TEMPERATURE meter (2), the buzzer switch (3), system overheat indicator light (5), TTC OVERHEATED indicator light (6), RSG OVERHEATED indicator light (7) and the OPERATING INSTRUCTIONS plate (1) are on the warning panel (fig. 18) and are used with the damper and shutter lever (4) to maintain the exhaust air temperature at a safe operating level below 130° F. The OPERATING INSTRUCTIONS plate gives instructions for adjusting the damper and shutter lever and for filter replacement, and explains the operation of the exhaust air overheat alarm.

(2) When the indication of the EXHAUST TEMPERATURE meter (2) on the warning panel rises to 140° F, the system overheat indicator light (5) illuminates and a warning buzzer sounds. This signals that the electron tubes and other circuit components of the radar and computer equipment are overheated. If the temperature of the air within the radar set group rises to 140° F, the RSG OVERHEATED indicator light (7) illuminates and the

warning buzzer sounds. This signifies that the electron tubes and other components of the radar set group are overheated. If the temperature of the air within the target radar control console rises to 140° F, the TTC OVERHEATED indicator light (6) illuminates and the warning buzzer sounds. This signifies that the electron tubes and other components of the target radar control console are overheated. When any of the overheat lights illuminates and the alarm buzzer sounds, the damper and shutter lever (4) should be set to OPEN. The warning buzzer is disabled by setting the buzzer switch (3) to the off (down) position. The illuminated overheat indicator light remains illuminated until the temperature drops to 130° F.

97 (U). Heating Equipment Control

Heating equipment in the heating and ventilation cabinet of systems 1086 and below differ in operation from heating equipment in the heating and ventilation cabinet of systems 1087 and above. Within a system, operation of heating equipment in the trailer mounted director station is identical to the operation of heating equipment in the trailer mounted tracking station. Therefore, only the operation of heating equipment in the trailer mounted direction station is discussed. Operation under normal and

emergency conditions of the heating equipment for systems 1086 and below is discussed in *a* and *b* below. Operation of the heating equipment under normal conditions for systems 1087 and above is discussed in *c* below. The heating equipment for systems 1087 and above does not have provisions for operation under emergency conditions. Further information pertaining to the heating equipment is provided in TM 9-2330-212-15.

a. Operation of Heating Equipment—Systems 1086 and Below.

(1) Ascertain that the ventilation blower belt behind the blower cover (fig. 21) has been connected to upper ventilation blower motor.

(2) Open the PERSONNEL COOLING EXHAUST port on the rear entrance door of the trailer. Open the PERSONNEL AIR INTAKE port on the curbside of the trailer. This permits fresh (make-up) ventilating air to be admitted to the trailer.

(3) Set the blower discharge damper control (A, fig. 69.2) to HEAT position. This allows heated air to discharge through the floor duct during operation of the heater.

Note. The heater cannot be operated unless the blower discharge damper control is in the HEAT position.

(4) Set the blower intake damper control (U, fig. 69.2) to 4 position for ambient temperatures above 25° F, to 5 position for ambient temperatures between −20° F and 25° F, or to 6 position for ambient temperatures below −20° F.

***Warning:* Do not operate the heater with blower intake damper control set to 7 RECIRCULATE position while trailer is occupied. No fresh air can be introduced to the ventilation blower motor at this setting.**

(5) Set HEATER switch (H, fig. 69.2) to START position. The white HEATER indicator light (N, fig. 69.2) and red PRIME indicator light (M, fig. 69.2) will illuminate.

(6) Set OUTPUT switch (J, fig. 69.2) to LOW position to permit combustion air blower motor to operate at half speed.

(7) Set thermostat on upper compartment door (fig. 20) to 65° F (maximum setting).

(8) Operate and hold PRIME switch (G, fig. 69.2) to ON position for approximately 15 seconds to operate fuel pump and fill fuel bowl. The heater usually ignites within a few seconds and the flame is visible through the sight tube. A longer priming time is required when fuel line is empty. Observation of fuel bowl discloses when fuel line is primed. The 15-second priming for starting heater is additional.

***Warning:* Do not look directly down sight tube during the prime and ignite cycle. Combustion of gases within chamber could eject eyepiece causing eye injury.**

(9) Wait 2 minutes before operating PRIME switch again. If combustion in heater has not started within 2 minutes after priming, repeat the 15-second priming periods at 2-minute intervals. If heater does not ignite after fourth attempted start, servicing of heater is required. When heater has ignited, operate and hold PRIME switch to ON position until red PRIME indicator light extinguishes. Immediately after red PRIME indicator light extinguishes, set HEATER switch to RUN position and NOR-

MAL VENT BLOWER switch (K, fig. 69.2) to ON position. Observe that white NORMAL VENT BLOWER indicator light (Q, fig. 69.2) illuminates.

(10) Adjust thermostat on upper compartment door to desired temperature. The OUTPUT switch should remain set to LOW position when heat output is sufficient. The HIGH position of OUTPUT switch permits heater to provide about twice the heat output of the LOW position and should be used only when low ambient temperatures exist, or when it it is desirable to bring trailer temperature up to the desired level as quickly as practicable.

(11) Set HEATER switch to OFF position to turn off heater. Ignition and fuel are turned off immediately but combustion air blower motor continues to operate and purges heater until flame switch cools and shuts if off and white HEATER indicator light extinguishes. Set NORMAL VENT BLOWER switch to OFF when white HEATER indicator light extinguishes.

b. Emergency Operation of Heating Equipment - Systems 1086 and Below. Emergency operation of heater is the same as normal operation discussed in a above except that EMERGENCY VENT BLOWER switch (L, fig. 69.2) instead of NORMAL VENT BLOWER switch is operated to the ON position. In addition, ventilation blower belt must be shifted from upper ventilation blower motor to lower emergency ventilation blower motor. Limit operation of emergency ventilation blower motor to as short a period as possible as the storage batteries can supply power for only a few hours, after such period recharging is required. When normal 400-cycle power has been restored to heating equipment, return ventilation blower belt to upper ventilation blower motor and resume normal operation of heater. Also, ascertain that storage batteries are returned to a fully charged condition immediately following emergency operation of heater equipment.

c. Operation of Heating Equipment - Systems 1087 and Above.

(1) Open PERSONNEL COOLING EXHAUST port in the entrance door of the trailer. Open PERSONNEL AIR INTAKE port on the curbside of trailer. This permits fresh (make-up) ventilating air to be admitted to the trailer.

(2) Set blower discharge damper control (A, fig. 69.3) to HEAT position. This allows heated air to discharge through floor duct during operation of heater.

Note. The heater cannot be operated unless blower discharge damper control is in HEAT position.

(3) Set blower intake damper control (N, fig. 69.3) to 4 position for ambient temperatures above 25° F, to 5 position for ambient temperatures between -20° F and 25°F, or to 6 position for ambient temperatures below -20° F.

WARNING: DO NOT OPERATE HEATER WITH BLOWER INTAKE DAMPER CONTROL SET TO 7 RECIRCULATE POSITION WHILE TRAILER IS OCCUPIED. NO FRESH AIR CAN BE INTRODUCED TO VENTILATION BLOWER MOTOR AT THIS SETTING.

(4) Set HEATER switch (H, fig. 69.3) to ON position. If heater does not start within 1 to 3 minutes, operate HEATER switch to OFF position and follow procedures in (*a*) through (*d*) below.

(*a*) Check fuel system for empty fuel tank.

(*b*) Check ignition system for proper connector contact.

(*c*) Depress RESET switch (G, fig. 69.3) momentarily.

(*d*) Set HEATER switch to ON position.

(5) Set heater thermostat (fig. 20) to temperature desired.

(6) Set HEATER switch to OFF position to turn off heater.

Note. The combustion and ventilation air blower motors continue to operate when HEATER switch is set to OFF position, purging and cooling heat exchanger until flame detector probe cools sufficiently to turn off heater.

98 (U). Lighting Equipment Control

a. Lighting Control in the Trailer Mounted Director Station.

(1) *Lighting control during normal conditions.*

(*a*) During normal conditions the BLACKOUT OVERRIDE switch (F, fig. 68) on the trailer door light panel (fig. 68) is set to the ON position. This causes the white incandescent light fixtures (A, fig. 30) to illuminate. Each fixture contains one white incandescent light except the second and fifth fixture from the trailer-mounted director station door. These two fixtures contain two white incandescent lights.

(*b*) With the CEILING LIGHTS switch (E, fig. 68) on the trailer door light panel (fig. 68) set to the ON position, all the white incandescent lights illuminate at full brilliance. With the CEILING LIGHTS switch set to the REMOTE position, the brilliance of all the incandescent ceiling lights but two is controlled by the CEILING LIGHTS switch (B, fig. 68) and the CEILING LIGHTS knob (A, fig. 68) on the tactical control-indicator (fig. 68) on the battery control console (fig. 24). The two not controlled remotely consist of one light in both the second and fifth incandescent light fixture (A, fig. 30) from the trailer door. These two lights do not illuminate during remote operation. If the CEILING LIGHTS switch on the tactical control-indicator is set to the BRIGHT position, all the white incandescent ceiling lights except the two explained above illuminate at full brilliance. If the CEILING LIGHTS switch on the tactical control-indicator is set to the DIM position, all the white incandescent ceiling lights except the two explained above may be adjusted to the desired brilliance by rotating the CEILING LIGHTS knob. The two lights previously mentioned not controlled remotely are emergency lights (par. 98*a*(3)).

(*c*) The ENTRANCE LIGHT OVERRIDE SWITCH (D, fig. 68) may be operated, during normal conditions, to extinguish the incandescent light in the first incandescent light fixture from the trailer-mounted director station door when the other white incandescent lights are illuminated.

(2) *Lighting control during blackout conditions.* During blackout conditions the BLACKOUT OVERRIDE switch (F, fig. 68) on the trailer door light panel (fig. 68) is set to the OFF position. This causes the white incandescent ceiling lights in the eight incandescent light fixtures (A, fig. 30) to illuminate provided the trailer door is closed. If the trailer door is opened, the trailer door interlock switch (G, fig. 68) operates, causing all white incandescent ceiling lights to extinguish and all blue blackout lights to illuminate. One blue blackout light is in each of the white incandescent light fixtures except the second and fifth fixtures from the trailer-mounted director station door. These two fixtures contain no blue blackout lights. The white incandescent lights illuminate and the blue blackout lights extinguish when the door is closed. When the trailer door is closed, the white incandescent lights may be controlled remotely from the tactical control-indicator (fig. 68) in the same manner as under normal conditions explained in (*a*) above. When the trailer door is closed, the ENTRANCE LIGHT OVERRIDE SWITCH (D, fig. 68) also functions as under normal conditions.

(3) *Lighting control during emergency conditions.* Two white incandescent lights provide illumination when generator power is not available. There is one light each in the second and fifth incandescent light fixture (A, fig. 30) from the trailer door. These lights are powered from the trailer 24-volt battery system. The CEILING LIGHTS switch (E, fig. 68) on the trailer door light panel (fig. 68) must be in the ON position for the two emergency lights to illuminate. There is no remote operation for the emergency lights.

(4) *Blacklight ceiling lights.* There are five blackout light fixtures (A, fig. 30) each of which contains a fluorescent black-

light. The blacklights illuminate the fluorescent-painted panel engravings so that they are easily visible when the white incandescent lights are dimmed or extinguished. The switch (C, fig. 68) on each blackout light fixture must be depressed and held until the associated blacklight illuminates. If a fluorescent blacklight is illuminated and the MAIN POWER switch (GG, fig. 70) on the acquisition power control panel (fig. 19) is then turned to the off (down) position, the fluorescent blacklight extinguishes. After the MAIN POWER switch is returned to the ON position, the blackout light switch on the particular fixture must be depressed, then released, then depressed again before the fluorescent blacklight illuminates.

***Warning:* Damage to the eyes can result from looking directly at the blacklights for a prolonged period of time.**

b. Lighting Control in the Trailer-Mounted Tracking Station.

(1) *Lighting control during normal conditions.*

(*a*) During normal conditions the BLACKOUT OVERRIDE switch (F, fig. 87) on the trailer door light panel (fig. 87) is set to the ON position. This causes the white incandescent lights in eight of the eleven incandescent light fixtures (A, fig. 38) to illuminate. The white incandescent lights (fig. 37) over the utility table do not illuminate. Each of the eight fixtures contains one white incandescent light except the second and fifth fixture from the trailer door. These two fixtures contain 2 white incandescent lights.

(*b*) With the CEILING LIGHTS switch (E, fig. 87) on the trailer door light panel (fig. 87) set to the ON position, all the white incandescent lights illuminate at full brilliance. With the CEILING LIGHTS switch set to the REMOTE position, the brilliance of all the incandescent ceiling lights but two is controlled by the CEILING LIGHTS switch (A, fig. 87) and the CEILING LIGHTS knob (B, fig. 87) on the electric light control (fig. 87) on the target radar control console (fig. 34). The two not controlled remotely consist of one light in both the second and fifth incandescent light fixture (A, fig. 38) from the trailer-mounted tracking station door. These two lights do not illuminate during remote operation. If the CEILING LIGHTS switch on the electric light control is set to the BRIGHT position' all the white incandescent ceiling lights except the two explained above illuminate at full brilliance. If the CEILING LIGHTS switch on the electric light control is set to the DIM position, all the white incandescent ceiling lights except the two explained above may be adjusted to the desired brilliance by rotating the CEILING LIGHTS knob.

(*c*) The ENTRANCE LIGHT OVERRIDE SWITCH (D, fig. 87) may be operated, during normal conditions, to extinguish the white incandescent light in the first incandescent light fixture from the trailer-mounted tracking station door when the other white incandescent lights are illuminated.

(2) *Lighting control during blackout conditions.* During blackout conditions the BLACKOUT OVERRIDE switch (F, fig. 87) on the trailer door light panel (fig. 87) is set to the OFF position. This causes the white incandescent ceiling lights, except the ones over the utility table, to illuminate provided the trailer-mounted tracking station door is closed. If the

trailer door is opened the trailer door interlock switch (G, fig. 87) operates, causing all white incandescent ceiling lights to extinguish and all blue blackout lights to illuminate. One blue blackout light is in each of the white incandescent light fixtures except the second and fifth fixtures from the trailer-mounted director station door and the fixture over the utility table (fig. 37). These fixtures contain no blue blackout lights. The white incandescent lights illuminate and the blue blackout lights extinguish when the trailer door is closed. When the trailer door is closed, the white incandescent lights may be controlled remotely from the electric light control (fig. 87) in the same manner as under normal conditions explained in (*a*) above. When the trailer door is closed, the ENTRANCE LIGHT OVERRIDE switch (D, fig. 87) also functions as under normal conditions.

(3) *Lighting control during emergency conditions.* Two white incandescent lights provide illumination when no generator power is available. There is one light each in the second and fifth incandescent light fixture (A, fig. 38) from the trailer door. These lights are powered from the trailer 24-volt battery system. The CEILING LIGHTS switch (E, fig. 87) on the trailer door light panel (fig. 87) must be in the ON position for the two emergency lights to illuminate. There is no remote operation for the emergency lights.

(4) *Blacklight ceiling lights.* There are four blacklight light fixtures (A, fig. 38) each of which contains a fluorescent blacklight. The blacklights illuminate the fluorescent-painted panel engravings so that they are easily visible when the white incandescent lights are dimmed or extinguished. A blacklight light switch (C, fig. 87) on each fixture must be depressed and held until the associated blacklight is illuminated. If a fluorescent blacklight is illuminated, and the MAIN POWER switch (R, fig. 88) on the radar power control panel (fig. 33) is then turned to the off (down) position, the fluorescent blacklight extinguishes. After the MAIN POWER switch is returned to the ON position, the blacklight light switch on the particular fixture must be depressed, then released, then depressed again before the fluorescent blacklight illuminates.

***Warning:* Damage to the eyes can result from looking directly at the blacklights for a prolonged period of time.**

(5) *Utility lights.* Three white incandescent lights (fig. 37) provide illumination of the utility table during normal conditions, or during blackout conditions provided the trailer door is closed. A light switch (H, fig. 87) controls the three white incandescent lights.

99. Operation of Radar Test Set TS-847A/MSW-1

a. General. The radar test set TS-847A/MSW-1 (fig. 53) has no operational function in the NIKE-HERCULES System, but is used only for testing and alining the target- and missile-tracking radar systems. All controls necessary for remote operation of the radar test set TS-847A/MSW-1 are on the missile control-indicator group (fig. 36) of the missile radar control console (B, fig. 31), and the target test control (fig. 34) of the target radar control console (A, fig. 31). To apply primary power to the radar test set TS-847A/MSW-1, both the MAIN POWER switch (R, fig. 88) on the radar power control panel (fig. 33) and the AC POWER switch (P, fig. 112) on the radar test set TS-847A/MSW-1 must be set to the ON position. The AC POWER switch is normally left in the ON position so that the application of primary power to the radar test set TS-847A/MSW-1 may be controlled by the MAIN POWER switch. To operate the radar test set TS-847A/MSW-1 from the trailer-mounted tracking station, the TEST switch (S, fig. 112) on the radar test set TS-847A/MSW-1 must be set to the REMOTE position.

b. Operation From the Target Radar Control Console. To operate the radar test set TS-847A/MSW-1 from the target radar control console, the track antenna reflector assembly (fig. 50) associated with the target-tracking radar system, must be positioned to the coordinates of the antenna and mast group OA-1600/T (fig. 52). To position the track antenna reflector assembly, the azimuth handwheel (H, fig. 96) and the elevation handwheel (C, fig. 96) on the target track control drawer (fig. 34) must be rotated until the azimuth and elevation dials (D, fig. 98) indicate the correct coordinates.

(1) The radar test set TS-847A/MSW-1 generates a target test signal when the TEST switch (J, fig. 96) on the target track control drawer (fig. 34) is in the TEST position and the TARGET-STANDBY-MISSILE switch (L, fig. 106) on the missile control-indicator group (fig. 36) is in the TARGET position. The RECEIVER TEST indicator light (A, fig. 95) on the target test control (fig. 34) illuminates when the TARGET-STANDBY-MISSILE switch is set to the TARGET position. The magnitude of the target test signal is controlled by the SIGNAL LEVEL knob (D, fig. 95) on the target test control. The setting of the SIGNAL LEVEL knob is indicated on the SIGNAL LEVEL dial (C, fig. 95). The dial is graduated from 0 to 35 db in increments of 1 db. The frequency of the target test signal can be varied by the FREQUENCY knob (B, fig. 95). Normally the frequency is set to a definite value and is not changed. The range represented by the target test signal may be increased or decreased by setting the RANGE-SLEW switch (F, fig. 95) to the IN or OUT position as required. The RANGE-TRIM knob (E, fig. 95) is used for fine adjustment of the range as represented by the target test signal.

(2) The target test signal is removed when the TARGET-STANDBY-MISSILE switch (L, fig. 106) on the missile control-indicator group is set to either the STANDBY or MISSILE position, or when the TEST switch (J, fig. 96) is set to the off (down) position. This also extinguishes the RECEIVER TEST indicator light (A, fig. 95).

c. Operation From the Missile Radar Control Console. To operate the radar test set TS-847A/MSW-1 from the missile radar control console (fig. 36) the track antenna reflector assembly (fig. 50) associated with the missile-tracking radar system must be positioned to the coordinates of the antenna and mast group OA-1600/T (fig. 52). To position the track antenna reflector assembly to these coordinates, the azimuth handwheel (J, fig. 104) and the elevation handwheel (N, fig. 104) on the missile track control drawer are rotated until the AZIMUTH dial (M, fig. 104) and the ELEVATION dial (S, fig. 104) on the missile track indicator (fig. 36) indicate the correct coordinates.

(1) The radar test set TS-847A/MSW-1 generates a missile test signal when the TEST switch (A, fig. 104) on the missile track control drawer is in the TEST position and the TARGET-STANDBY-MISSILE switch (L, fig. 106) on the missile control-indicator group is in the MISSILE position. The RECEIVER TEST indicator light (M, fig. 106) on the missile control-indicator group illuminates when the TARGET-STANDBY-MISSILE switch is set to

the MISSILE position. The magnitude of the missile test signal is controlled by the SIGNAL LEVEL knob (R, fig. 106). The setting of the SIGNAL LEVEL knob is indicated on the SIGNAL LEVEL dial (P, fig. 106). The dial is graduated from 0 to 35 db in increments of 1 db. The range represented by the missile test signal may be increased or decreased by setting the RANGE-SLEW switch (Q, fig. 106) to the IN or OUT position as required. The RANGE-TRIM knob (N, fig. 106) is used for fine adjustment of the range represented by the missile test signal.

(2) The missile test signal is removed when the TARGET-STANDBY-MISSILE switch (L, fig. 106) on the missile control-indicator group is set to either the TARGET or STANDBY position, or when the TEST switch (A, fig. 104) is set to the off (down) position. This also extinguishes the RECEIVER TEST indicator light.

Section III. TACTICAL CONTROLS AND INDICATORS

100. Equipment Status Control

a. General. Four equipment status indicator lights (A-D, fig. 75) are on the upper right frame (fig. 24) of the battery control console in the trailer-mounted director station. Four equipment status indicator lights (A-D, fig. 101) are also on the upper center access door (fig. 34) of the target radar control console in the trailer-mounted tracking station. These equipment status indicator lights are controlled by the equipment status switch (U, 1, fig. 78) on the tactical control-indicator (fig. 24) on the battery-control console. When any one is illuminated, it indicates the prevailing equipment status for the NIKE-HERCULES System. The four equipment status indicator lights, on each console, from left to right, are white, yellow, blue and red, and indicate in the same order increasing degrees of equipment preparation for firing. Only one color indicator light is illuminated at any given time. When the equipment status switch is set from one position to another position, a gong in the target radar control console sounds.

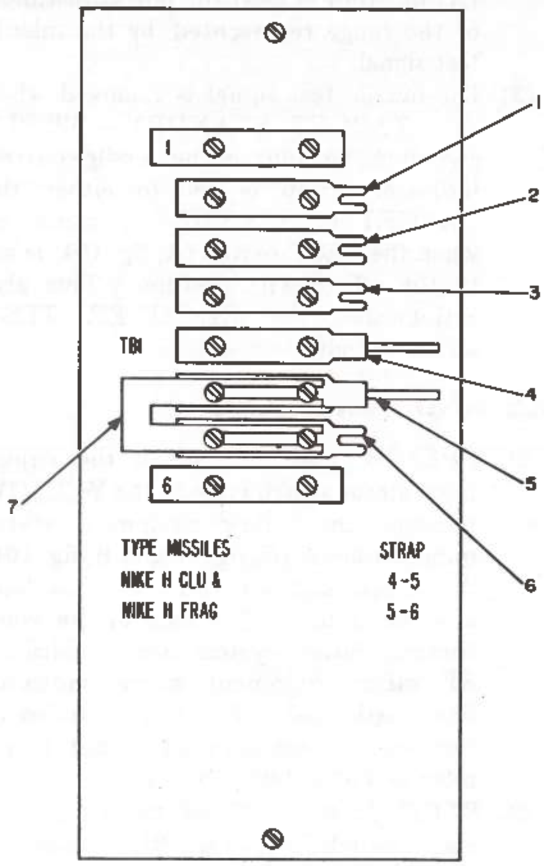
b. Equipment Status Switch.

(1) *WHITE position.* When the equipment status switch (U, 1, fig. 78) is set to the WHITE position, the white equipment status indicator lights (A, fig. 75) and (A, fig. 101) illuminate. All other equipment status indicator lights extinguish.

(2) *YELLOW position.* When the equipment status switch is set to the YELLOW position, the yellow equipment status indicator lights (B, fig. 75 and B, fig. 101) illuminate, and the command hot loop and the technical hot loop of the voice communication system are established. All other equipment status indicator lights extinguish. For detailed information on the communication hot loops, refer to TM 9-1400-251-12.

(3) *BLUE position.* When the equipment status switch is set to the BLUE position, the blue equipment status indicator lights (C, fig. 75 and C, fig. 101) illuminate. All other equipment status indicator lights extinguish.

(4) *RED position.* When the equipment status switch is set to the RED position, the red equipment status indicator lights (D, fig. 75 and D, fig. 101) illuminate. The multichannel data recorder (fig. 23) automatically begins operating provided the RECORD-VIEW switch (K, fig. 72) is in the RECORD position, and a target has been designated. All other equipment status indicator lights extinguish. Operation of the multichannel data recorder is discussed in paragraph 95.



ORD G561261

1—Terminal 1
2—Terminal 2
3—Terminal 3
4—Terminal 4
5—Terminal 5
6—Terminal 6
7—Strap

Figure 131 (U). Terminal board TB 1—upper right frame—battery control console—strapping.

101 (CMHA). Mission and Missile Selection Control

a. Mission Selection. During normal operation the setting of the MISSION switch (LL, 1, fig. 77) on the battery signal panel-indicator (fig. 24) determines the type mission for a particular engagement.

(1) When the MISSION switch is set to the SS position, the NIKE-HERCULES System is partially conditioned for the surface-to-surface mode of operation, and the MISSION-SS indicator light (A, 1, fig. 77) illuminates. For a more detailed discussion of the operation of the NIKE-HERCULES System during a surface-to-surface mission, refer to paragraph 114.

(2) When the MISSION switch is set to the SA position, the NIKE-HERCULES System is automatically conditioned for the surface-to-air mode of operation, and the MISSION-SA indicator light (B, 1, fig. 77) illuminates. The surface-to-air mission is discussed in detail in paragraph 112.

(3) When the MISSION switch is set to the LA position, the NIKE-HERCULES System is automatically conditioned for the low-altitude mode of operation, and the MISSION-LA indicator light (C, 1, fig. 77) illuminates. The low altitude mission is discussed in detail in paragraph 113.

b. Missile Selection.

(1) Before selection of a fragmentation or cluster warhead missile for firing, it is necessary that terminal board TB1 (fig. 131) behind the upper right frame of the battery control console (fig. 76) be checked for proper strapping. The strapping of this terminal board determines whether the NIKE-HERCULES System is conditioned for firing a missile with a fragmentation warhead or a missile with a cluster warhead. Figure 131 shows terminals 5 and 6 (5 and 6, fig. 131) of terminal board TB1 strapped for firing NIKE H FRAG type missiles (NIKE-HERCULES missiles with fragmentation warheads). This strapping is also used for NIKE-AJAX missiles, which are always equipped with fragmentation warheads. Terminals 4 and 5 (4 and

5, fig. 131) are strapped for firing NIKE H CLU type missiles (NIKE-HERCULES missiles with cluster warheads). The proper strapping for firing missiles with fragmentation warheads is shown on terminal board TB1.

Note. When NIKE-HERCULES Systems are shipped from the factory, terminal board TB1 is strapped for firing NIKE-AJAX missiles or NIKE-HERCULES missiles with fragmentation warheads.

(2) The MISSILE switch (GG, 1, fig. 77) on the battery signal-panel indicator

Figure 131.1. (Deleted)

(fig. 24) is used to select the type of missile to be used by the NIKE-HERCULES System for a particular engagement. Two banks of four indicator lights each are above the MISSILE switch. An upper bank of four indicator lights (D, E, F, and G, 1, fig. 77) is used with the FUIF equipment at a semi-mobile site. When the light corresponding to either I-HE, B-HE, B-XS, or B-XL illuminates, it indicates the type of missile designated for battery use by the Army Air Defense Command Post (AADCP). The lower bank of four indicator lights (A, B, C, and, D, 2, fig. 77) is controlled by the MISSILE switch (GG, 1, fig. 77).

(*a*) When the MISSILE switch is set to the I-HE position, the MISSILE-BTRY-I-HE indicator light (A, 2, fig. 77) illuminates, indicating that a NIKE-AJAX high explosive missile is designated for the current engagement.

(*b*) When the MISSILE switch is set to the B-HE position, the MISSILE-BTRY-B-HE indicator light (B, 2, fig. 77) illuminates, indcating that a NIKE-HERCULES high explosive missile is designated for the current engagement.

(*c*) When the MISSILE switch is set to the B-XS position, the MISSILE-BTRY-B-XS indicator light (C, 2, fig. 77) illuminates, indicating that a NIKE-HERCULES small prime warhead missile is designated for the current engagement. When the switch is in this position, the MISSILE (left) side of the altitude plotting board (fig. 24) glows red.

(*d*) When the MISSILE switch is set to the B-XL position, the MISSILE-BTRY-B-XL indicator light (D, 2, fig. 77) illuminates, indicating that a NIKE-HERCULES large prime warhead missile has been designated for the current engagement. When the switch is in this position, the MISSILE (left) side of the altitude plotting board (fig. 24) glows red.

c. Launcher Data.

(1) The LAUNCHER DATA switch (JJ, 1, fig. 77), when depressed, releases the information determined by the setting of the MISSION switch (LL, 1, fig. 77) and the MISSILE switch (GG, 1, fig. 77) to the launching equipment. The LAUNCHER DATA-RELEASED indicator light (HH, 1, fig. 77) when illuminated, indicates that the launcher data has been released to the launching equipment. The LAUNCHER DATA-NOT RELEASED indicator light (KK, 1, fig. 77) when illuminated, indicates that the selected missile and mission data has not been released to the launching equipment.

(2) The launcher data circuitry does not release data for an incorrect selection of mission and missile. An incorrect selection of mission and missile occurs when the MISSION switch (LL, 1, fig. 77) is set to the LA position, and the MISSILE switch (GG, 1, fig. 77) is set to either the B-XS or B-XL position; or when the MISSION switch is set to the SS position and the MISSILE switch is set to the I-HE position. If an incorrect selection of mission and missile combination occurs, the pertinent MISSION indicator light and MISSILE indicator light extinguish, and the LAUNCHER DATA-NOT RELEASED indicator light (KK, 1, fig. 77) remains illuminated when the LAUNCHER DATA switch (JJ, 1, fig. 77) is depressed.

(3) The selected mission and missile combination may be changed and transmitted

to the launching equipment and computer system by the LAUNCHER DATA switch any time before the fire order is issued. After the fire order is issued, a mission and missile combination may be selected by the MISSION switch and the MISSILE switch, but will not affect the computer system until after the burst order has been issued, and cannot be released to the launching area until missile away has been detected.

102. Minimum Burst Altitude Control

a. Minimum burst altitude control functions only when a prime warhead missile is selected. The purpose of this control is to assure that a prime warhead missile does not descend below a safe altitude.

(1) The MIN. BURST ALTITUDE knob (J, 1, fig. 77) on the battery signal panel-indicator is used to assist in setting minimum burst altitude data into the computer system circuitry. The minimum burst altitude is indicated on the MIN. BURST ALTITUDE 1000'S FEET dial (H, 1, fig. 77). The dial is graduated from 0 to 30, representing 0 to 30,000 feet, in increments of 0.5, representing 500 feet. If the missile descends below the minimum burst altitude, a burst order is automatically issued by the computer system provided the MIN BURST ALT OVERRIDE switch (W, 1, fig. 78) on the tactical control-indicator is in the off position.

(2) When the MIN BURST ALT OVERRIDE switch is turned to the on position, the minimum burst altitude restriction is no longer effective.

b. The LIMITED TARGET DAMAGE indicator light (EE, 1, fig. 77) on the battery signal panel-indicator, when illuminated, indicates that the selected target is such a distance below the minimum burst altitude that the full burst effect is not achieved.

103. Missiles Prepared Control

The MISSILES PREPARED meter (K, 1, fig. 77) on the battery signal panel-indicator (fig. 24) indicates the number of missiles prepared by the launching area of the type corresponding to the setting of the MISSILES PREPARED switch (DD, 1, fig. 77). The MISSILES PREPARED meter is graduated from 0 to 16 in increments of one. The four settings of the MISSILES PREPARED switch are I-HE, B-HE, B-XS, and B-XL.

CHAPTER 6 (CMHA)

OPERATION OF THE RADAR COURSE DIRECTING CENTRAL

Section 1 (CMHA). ENERGIZING THE EQUIPMENT

104 (U). General

a. This section gives the procedure for energizing the acquisition radar system, the computer system, recording equipment, target tracking radar system, missile tracking radar system, and radar test set TS-847A/MSW-1. The energizing procedures for each system, for the radar test set, and for the recording equipment, are given separately. These procedures should be performed in the step-by-step sequence as given in paragraphs 105 through 110.

b. The equipment comprising the acquisition radar system, the computer system, the target tracking radar system, and the missile tracking radar system may be partially or fully energized, depending on the tactical situation. When partially energized, the system is in the "low voltage" condition; when fully energized, it is in the "operate" condition. In the "low voltage" condition the system is not operative but is in a state of readiness so that operation can begin in a minimum time. The advantage of the "low voltage" condition is that it reduces wear of the equipment. In the "operate" condition, the equipment is fully energized and ready for actual engagement operation.

c. Operation of the acquisition radar system, the computer system, the target tracking radar system, and the missile tracking radar system is related to operation of the equipment cooling system, discussed in paragraph 96. Before operation is begun, operating personnel should be familiar with the procedure for maintaining the operating temperature within safe limits.

d. The operator should notify the organizational maintenance technician if any abnormal condition is encountered during the energizing operation.

105 (U). Energizing the Acquisition Radar System

a. Position of Controls Prior to Energizing. The procedure for energizing the acquisition radar system requires that certain controls be adjusted or placed in a particular position prior to energizing the system. Prior positioning of controls as given in table II is necessary to insure that the application of power is controlled by the proper step-by-step energizing procedure to prevent possible damage to the equipment. Controls not given in the table need not be preset, since they do not directly affect the energizing procedure.

Table II (CMHA). Position of Controls Prior to Energizing—Acquisition Radar System

Location	Control	Control setting	Reference: Figure	Reference: Key
		Note. Prior to operation, all cabinet doors in the trailer mounted director station and the trailer mounted tracking station must be secured to close all interlock switches. *Note.* Upon entering the trailer mounted director station, set the BLACKOUT OVERRIDE switch to the on (up) position and set the CEILING LIGHTS switch to REMOTE.		
Trailer-mounted director station (curbside)	EQUIPMENT COOLING INTAKE cover	Open		
	EQUIPMENT COOLING EXHAUST cover	Open		

Table II (CMHA). Position of Controls Prior to Energizing—Acquisition Radar System—Continued

Location	Control	Control setting	Reference	
			Figure	Key
Acquisition antenna-receiver-transmitter group		•	39	
Acquisition antenna pedestal	Antenna disable switch	ON	108	A
Director station group			A, 16 and 19	
Acquisition power control panel—rear	EQPT VENT switch	On (up)	71	B
Acquisition power control panel—rear	ACQ MOTORS switch	ON	71	A
Acquisition power control panel—rear	VOLTS ADJ switch (Used only in systems 1097 and subsequent)	IN *Note.* The VOLTS ADJ switch is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine-driven generators are employed. When only one generator is used, line voltage adjustments must be made in the trailer mounted tracking station using the ADJUST PHASE C knob (E, fig. 88) on the radar power control panel. When more than one engine-driven generator is used, line voltage adjustments may be made in either trailer, provided the VOLTS ADJ switch is locked in IN.	71	C
Acquisition power control panel—front	BATTLE SHORT switch	Off (down) protective cover must be down and safety wired	70	NN
Acquisition power control panel—front	MAIN POWER switch	Off (down) *Note.* This switch must be left in the ON position if the computer system, target tracking radar system, or the missile tracking radar system is energized and is to remain energized.	70	GG
Acquisition power control panel—front	ACQUISITION POWER switch	Off (down)	70	DD
Acquisition power control panel—front	PLATE VOLTS switch	OFF	70	JJ
Acquisition power control panel—front	VOLTS CHECK switch	OFF	70	MM
Acquisition power control panel—front	TRACK TRANSMITTER FILAMENTS switch	Off (down)	70	V
Computer power supply group			B, 16 and 27	
Computer power control panel	COMPUTER POWER switch	Off (down) *Note.* This switch must be left in the ON position if the computer system is energized and is to remain energized.	83	Z
Battery control console			A, 16 and 24	
Acquisition control-indicator	MAGNETRON HV supply knob	START (fully counter-clockwise)	82	QQ
Acquisition control-indicator	IND HV switch	OFF	82	JJ
Acquisition control-indicator	NOISE GEN switch	OFF	82	C
Acquisition control-indicator	AFC switch	On (up)	82	E

Table II (CMHA). Position of Controls Prior to Energizing—Acquisition Radar System—Continued

Location	Control	Control setting	Reference	
			Figure	Key
Battery control console—Con.				
Acquisition control-indicator	ANTENNA-AZIMUTH RPM switch	OFF	82	M
Acquisition control-indicator	ANTENNA ELEVATION scan switch	Center	82	P
Acquisition control-indicator	IFF-GTC switch	LONG	82	S
Acquisition control-indicator	IFF-MODE switch	1, 2, or 3	82	T
Acquisition control-indicator	IFF-GAIN knob	Fully counterclockwise	82	K
Acquisition control-indicator	IFF-CHOP switch	Off (down)	82	DD
Acquisition control-indicator [2]	AJD switch	OFF	82.1	4
Video decoder	POWER	ON	69.1	B
PPI [1]	SYMBOL INTENSITY knob	Fully counterclockwise	80	J
Precision indicator	INTENSITY knob	Fully counterclockwise	81	A
Precision indicator	GAIN knob	Fully counterclockwise	81	B
PPI	INTENSITY knob	Fully counterclockwise	80	B
PPI	GAIN knob	Fully counterclockwise	80	C
PPI	EXPANSION switch	OFF	80	E
PPI	SYMBOLS switch	OFF	80	F
PPI	RANGE switch	250,000	80	G
Target designate control-indicator	Range MAN-AID switch	MAN	79	E
Tactical control-indicator	SIGNAL LIGHTS knob	Fully clockwise	78	J, 1

[1] Applies to systems 1307 and above and systems below 1307 that have MWO ORD Y28-W29 installed.
[2] Used in NIKE-HERCULES systems with anti-jam display (AJD) capabilities.

b. Application of Power—"Shutdown" to "Low Voltage". To place the acquisition radar system in the "low voltage" condition, perform steps in table III in the sequence given.

Table III (U). Application of Power—"Shutdown" to "Low Voltage"—Acquisition Radar System

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
				Prerequisites: *a.* Check that 400-cycle engine-driven generators are operating. *b.* Check engine-driven generators to see that frequency is within specified limits and that magnitude of output voltage can be controlled remotely.		

Table III (U). Application of Power—"Shutdown" to "Low Voltage"—Acquisition Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
				Caution: **Damage to or failure of the equipment may result from energizing the equipment when the frequency or voltage is out of tolerance.**		
	Director-station group				A, 16 and 19	
1	Acquisition power control panel	PHASE switch	C		70	W
2	Acquisition power control panel	ADJUST PHASE C knob	Turn knob until LINE VOLTS meter (U, fig. 70) indicates 120 volts	*Note.* The VOLTS ADJ switch (C, fig. 71) is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine-driven generators are employed. When only one generator is used, line voltage adjustments must be made in the trailer mounted tracking station using the ADJUST PHASE C knob (E, fig. 88) on the radar power control panel. When more than one engine-driven generator is used, line voltage adjustments may be made in either trailer, provided the VOLTS ADJ switch is locked in IN.		
3	Acquisition power control panel	PHASE switch	A	LINE VOLTS meter should indicate 117.5 to 122.5 volts.	70	W
4	Acquisition power control panel	PHASE switch	B	LINE VOLTS meter should indicate 117.5 to 122.5 volts.	70	W
5	Acquisition power control panel	PHASE switch	C	Returns switch to proper setting for monitoring purposes.	70	W
6	Acquisition power control panel	MAIN POWER switch	ON	*a.* Makes 3-phase power available to the acquisition radar system and the computer system. *b.* Supplies power to the recorder group (A, fig. 16), personnel heater, equipment cooling cabinet assembly, trailer lighting equipment (figs. 30 and 30.1), and 110-volt ac outlets (A and B, fig. 16), in the trailer mounted director station. *c.* Supplies power to personnel heater (A, fig. 31), trailer lighting equipment (fig. 38), and 110-volt ac outlets (A and B, fig. 31) in the trailer mounted tracking station.	70	GG

Table III (U). Application of Power—"Shutdown" to "Low Voltage"—Acquisition Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
6				*d.* Supplies power to the 110-volt ac outlets on the missile and target track antenna-receiver-transmitter groups (fig. 49). *e.* All ivory tactical control indicator lights in the trailer mounted director station and the trailer mounted tracking station illuminate.		
6.1	Battery control console Horizontal plotting board	EJECT TRAINER switch	Depress	EJECT TRAINER indicator light extinguishes	A, 16 and 24 74	G

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Table III. Application of Power—"Shutdown" to "Low Voltage"—Acquisition Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
7	Acquisition power control panel.	ACQUISITION POWER switch.	ON	*a.* Applies power to blower and motors in acquisition antenna-receiver-transmitter group (fig. 39). *b.* Applies filament voltage to acquisition radar system. *c.* Energizes 30-second delay timer. After 20 to 24 seconds have expired, PLATE VOLTS-READY indicator light (KK, fig. 70) illuminates. *d.* INTLK indicator light (LL, fig. 70) illuminates immediately and HIGH VOLTS-PREHEAT indicator light (BB, fig. 70) illuminates within 5 seconds. *e.* The 5-minute delay timer energizes. After 5-minute time delay has expired, HIGH VOLTS-HOT indicator light (AA, fig. 70) illuminates. *Note.* If desired, operating personnel may continue with steps 8–11 without waiting for 15-minute time delay to expire.	70	DD
8	Acquisition power control panel.	PLATE VOLTS switch.	On (up)	*a.* Applies plate voltage to the acquisition radar system. *b.* PLATE VOLTS-ON indicator light (HH, fig. 70) on the acquisition power control panel, and AFC-HUNT indicator light (D, fig. 82) on the acquisition control-indicator (fig. 24) illuminate. *c.* PLATE VOLTS-READY indicator light (KK, fig. 70) extinguishes.	70	JJ

Table III. Application of Power—"Shutdown" to "Low Voltage"—Acquisition Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
				d. HIGH VOLTS-READY indicator light (Z, fig. 70) on the acquisition power control panel, and MAGNETRON-READY indicator light (PP, fig. 82) on the acquisition control-indicator (fig. 24) illuminate, provided HIGH VOLTS-HOT indicator light (AA, fig. 70) is illuminated. *e.* MAG FREQ & REC NOISE meter (G, fig. 82) on the acquisition control-indicator (fig. 24) indicates relative frequency of the magnetron. *Note.* Repeat steps 1 and 2 above before continuing with step 9.		
9	Acquisition power control panel.	TRACK TRANSMITTER FILAMENTS switch.	On (up)	*Note.* Normally, this switch is operated only if a minimum warm-up time is desired when energizing the missile and target-tracking radar systems from "shutdown" to "low voltage."	70	V
10	Acquisition power control panel.	VOLTS CHECK switch.	Turn switch in clockwise direction to each of marked voltages in succession.	*a.* Permits selection of dc power supply voltages to be checked on VOLTS CHECK meter (PP, fig. 70). *b.* At each position of switch, pointer should rise to meter segment shown in listing below. *Note.* If pointer falls outside limits of a particular segment, an organizational-maintenance technician must correct the malfunction causing incorrect meter reading before the system can be operated.	70	MM

Table III. Acquisition of Power—"Shutdown" to "Low Voltage"—Acquisition Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference: Figure	Reference: Key
				Switch position / *Meter segment* OFF — −250 ¾ −320 ¾ +150 ¾ +220 ¾ +250 ¾ +320A ¾ +320B ¾ +175 ½ +270 ½ −28 ¼ +1550 0		
11	Acquisition power control panel.	VOLTS CHECK switch.	OFF	*Note.* After HIGH VOLTS-HOT indicator light (AA, fig. 70) HIGH VOLTS-READY indicator light (Z, fig. 70), and MAGNETRON-READY indicator light (PP, fig. 82) illuminate, acquisition radar system is in "low voltage" condition.	70	MM

c. *Application of Power—"Low Voltage" to "Operate".* To transfer the acquisition radar system from "low voltage" to "operate" condition, perform the steps in table IV in the sequence given.

Table IV. Application of Power—"Low Voltage" to "Operate"—Acquisition Radar System

Step	Location	Control	Control setting	Remarks	Reference: Figure	Reference: Key
	Trailer-mounted director station.					
	Battery-control console:				A, 16 and 24	
1	Acquisition control indicator.	IND HV switch	On (up)	Applies high voltage to PPI (fig. 24) and precision indicator. The IND HV-ON indicator light (KK, fig. 82) illuminates.	82	JJ

Table IV. Application of Power—"Low Voltage" to "Operate"—Acquisition Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
	Director station group:				A, 16 and 19	
2	Acquisition power control panel.	VOLTS CHECK switch.	Turn switch in clockwise direction to each of marked voltages in succession.	*a.* Permits selection of dc power supply voltages to be checked on VOLTS CHECK meter (PP, fig. 70). *b.* At each position of VOLTS CHECK switch, pointer should rise to meter segment shown in listing below. *Note.* If pointer falls outside limits of a particular segment an organizational-maintenance technician must correct the malfunction causing incorrect meter reading before the system can be operated. *Switch position* — *Meter segment* OFF — – –250 — ¾ –320 — ¾ +150 — ¾ +220 — ¾ +250 — ¾ +320A — ¾ +320B — ¾ +175 — ½ +270 — ½ –28 — ¼ +1550 — ¼	70	MM
3	Acquisition power control panel.	VOLTS CHECK switch.	OFF		70	MM
	Battery-control console:				A, 16 and 24	
4	Acquisition control-indicator.	Frequency switch.		Obtain value to be indicated on MAG FREQ & REC NOISE meter (G, fig. 82) from battery control officer. Operate frequency switch to INCREASE FREQ or DECREASE FREQ position until value desired is indicated on MAG FREQ & REC NOISE meter.	82	F

Table IV (CMHA). Application of Power—"Low Voltage" to "Operate"—Acquisition Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
5	Acquisition control-indicator	MAGNETRON-ON switch	Depress	*a.* The MAGNETRON-ON indicator light (MM, fig. 82) illuminates and MAGNETRON-READY indicator light (PP, fig. 82) extinguishes. *b.* Applies high voltage to the acquisition transmitter system. *c.* The HIGH VOLTS-ON indicator light (Y, fig. 70) on the acquisition power control-panel (fig. 19) illuminates. The following indicator lights on the acquisition power control-panel extinguish. (1) HIGH VOLTS-PREHEAT indicator light (BB, fig. 70). (2) HIGH VOLTS-HOT indicator light (AA, fig. 70). (3) HIGH VOLTS-READY indicator light (Z, fig. 70). (4) INTLK indicator light (LL, fig. 70).	82	LL
6	Acquisition control-indicator	MAGNETRON HV SUPPLY knob	Turn knob smoothly clockwise until 30 to 33 milliamperes of current is indicated on the MAGNETRON meter (A, fig. 82). Arcing within the magnetron may cause the meter indication to be unstable for the first few seconds of operation. The MAGNETRON HV SUPPLY knob should be turned until 30 milliamperes is indicated on the meter	***Caution:* Do not force knob beyond the mechanical stops. If fluctuation is sufficient to actuate the over-current sensing device, causing MAGNETRON-ON indicator light (MM, fig. 82) to extinguish, turn the knob counterclockwise to START and notify an organizational maintenance technician.** *Note.* The MAGNETRON switch (RR, fig. 82) must be in the center position (FS 50MA) for adjustment specified in step 6.	82	QQ

Table IV (CMHA). Application of Power—"Low Voltage" to "Operate"—Acquisition Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
6			after indication has stabilized.			
7	Acquisition control-indicator	ANTENNA-AZIMUTH RPM switch	5	The acquisition antenna (fig. 39) rotates at a constant speed of 5 rpm. This rotational speed is desirable for long range operation.	82	M
8	Acquisition control-indicator	RECEIVER-GAIN knob	Turn to obtain clear presentation of acquisition reference marks on PPI (fig. 113).		82	GG
9	PPI	RANGE switch	250,000	Maximum range is displayed on the PPI (fig. 24).	80	G
10	PPI	INTENSITY knob	Turn clockwise until rotating radial sweep (C, fig. 113) on the PPI is barely visible.	*Caution:* **The electrostatic cathode-ray tube used for the PPI employs a long persistance phosphor that burns very easily. The PPI should not be operated at a high intensity level as the cathode-ray tube will be permanently damaged.**	80	B
11	PPI	GAIN knob	Turn clockwise to obtain a clear presentation of acquisition reference marks on PPI (fig. 113).		80	C
11.1	PPI	SYMBOL INTENSITY knob	Turn clockwise until FUIF and IFF symbols displayed on the PPI have optimum brilliance without distortion.		80	J

Table IV (CMHA). Application of Power—"Low Voltage" to "Operate"—Acquisition Radar System—Continued

					Reference	
Step	Location	Control	Control setting	Remarks	Figure	Key
12	Precision indicator	INTENSITY knob	Turn clockwise until the sweep on the precision indicator (B, fig. 115) is barely visible.	*Note.* If a back sweep is visible, on precision indicator, turn INTENSITY knob counterclockwise until only a normal sweep appears.	81	A
13	Precision indicator	GAIN knob	Turn clockwise to obtain maximum clarity on the precision indicator.		81	B

106 (U). Energizing the Computer System

a. Position of Controls Prior to Energizing. The procedure for energizing the computer system requires that certain controls be adjusted or placed in a particular position prior to energizing the system. Prior positioning of controls as given in table V is necessary to insure that the application of power is controlled by the proper step-by-step energizing procedure to prevent possible damage to the equipment. Controls not given in the table need not be preset, since they do not directly affect the energizing procedure.

Table V (U). Position of Controls Prior to Energizing—Computer System

Location	Control	Control setting	Reference Figure	Reference Key
		Note. Prior to operation, all cabinet doors in the trailer mounted director station and the trailer mounted tracking station must be secured to close all interlock switches. *Note.* Upon entering the trailer mounted director station, set the BLACKOUT OVERRIDE switch to the on (up) position and set the CEILING LIGHTS switch to REMOTE.		
Trailer mounted director station (curbside)	EQUIPMENT COOLING INTAKE cover	Open		
	EQUIPMENT COOLING EXHAUST cover	Open		
Director station group			A, 16 and 19	
Acquisition power control panel—rear	EQPT VENT switch	On (up)	71	B
Acquisition power control panel—rear	VOLTS ADJ switch used only in systems 1097 and subsequent	IN *Note.* The VOLTS ADJ switch is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine-driven generators are employed. When only one generator is used, line voltage adjustments must be made in the trailer mounted tracking station, using the ADJUST PHASE C knob (E, fig. 88) on the radar power control panel. When more than one engine-driven generator is used, line voltage adjustments may be made in either trailer, provided the VOLTS ADJ switch is locked in IN.	71	C

Table V (U). Position of Controls Prior to Energizing—Computer System—Continued

Location	Control	Control setting	Reference	
			Figure	Key
Director station group—Con.				
Acquisition power control panel—front	BATTLE SHORT switch	Off (down) (protective cover must be down and safety wired).	70	NN
Acquisition power control panel—front	MAIN POWER switch	Off (down) *Note.* This switch must be left in the ON position if the acquisition radar system, the target tracking radar system, or the missile tracking system is energized and is to remain energized.	70	GG
Acquisition power control panel—front	ACQUISITION POWER switch	Off (down) *Note.* This switch must be left in the ON position if the acquisition radar system is energized and is to remain energized.	70	DD
Computer power supply group			B, 16 and 27	
Computer power control panel	COMPUTER POWER switch	Off (down)	83	Z
Computer power control panel	PLATE VOLTS switch	Off (down)	83	X
Computer power control panel	SERVO DC switch	Off (down)	83	V
Computer power control panel	VOLTS CHECK switch	OFF	83	AA
Servo computer assembly			B, 16 and 28	
Computer control-panel	COMPUTER CONDITION switch	STANDBY	84	PP
Computer control-panel	SERVO LIGHTS knob	Fully clockwise	84	NN
Computer control-panel	LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS-X dial	Loosen associated locknut and turn LOCATION OF MISSILE RADAR FROM TARGET RADAR - YARDS - X knob (D, fig. 84) until dial indicates value shown on PARALLAX DATA RECORD plate (QQ, fig. 84). Tighten locknut.	84	C
Computer control-panel	LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS-Y dial	Loosen associated lockout and turn LOCATION OF MISSILE RADAR FROM TARGET RADAR - YARDS - Y knob (G, fig. 84) until dial indicates value shown on PARALLAX DATA RECORD plate (QQ, fig. 84). Tighten locknut.	84	F
Computer control-panel	LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS-H dial	Loosen associated locknut and turn LOCATION OF MISSILE RADAR FROM TARGET RADAR - YARDS - H knob (K, fig. 84) until dial indicates value shown on PARALLAX DATA RECORD plate (QQ, fig. 84). Tighten locknut.	84	J

Table V (U). Position of Controls Prior to Energizing—Computer System—Continued

Location	Control	Control setting	Reference Figure	Reference Key
Servo computer assembly—Con.				
Computer control-panel	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-X dial	Loosen associated locknut and turn LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-X knob (N, fig. 84) until dial indicates value shown on PARALLAX DATA RECORD plate (QQ, fig. 84). Tighten locknut.	84	M
Computer control-panel	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-Y dial	Loosen associated locknut and turn LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-Y knob (R, fig. 84) until dial indicates value shown on PARALLAX DATA RECORD plate (QQ, fig. 84). Tighten locknut.	84	Q
Computer control-panel	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-H dial	Loosen associated locknut and turn LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-H knob (U, fig. 84) until dial indicates value shown on PARALLAX DATA RECORD plate (QQ, fig. 84). Tighten locknut.	84	T
Computer control-panel	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-R dial	Loosen associated locknut and turn LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS-R knob (X, fig. 84) until dial indicates value shown on PARALLAX DATA RECORD plate (QQ, fig. 84). Tighten locknut.	84	W
Computer control-panel—rear	HT OF SITE dial	Obtain value to be set in from the battery control officer. Loosen associated locknut and turn HT OF SITE knob (A, fig. 86) until dial indicates desired value. Tighten locknut.	86	B
Computer control-panel—rear	BUR TIME BIAS dial	Obtain value to be set in from the battery control officer. Loosen associated locknut and turn BUR TIME BIAS knob (C, fig. 86) until dial indicates desired value. Tighten locknut.	86	D
Battery control console			A, 16 and 24	
Tactical control-indicator	Plotting board condition switch	STANDBY	78	G, 2
Tactical control-indicator	PLOTTING LIGHTS-HORIZONTAL knob	Fully clockwise	78	G, 1
Tactical control-indicator	PLOTTING LIGHTS-ALTITUDE knob	Fully clockwise	78	H, 1

b. Application of Power—"Shutdown" to "Computer Standby".

(1) The procedure for energizing the computer system from "shutdown" to "computer standby" is given in table VI. The computer system dc power voltage checks are made each time the computer system is energized. These checks are performed to insure that the outputs of the dc power supplies are within specified limits. Adjustments to bring the outputs of the dc power supplies within limits require access to the interior of the equipment and are normally performed by an organizational maintenance technician.

(2) The normal indication for each step performed during the energizing procedure is tabulated under the "Remarks" column of table VI.

Note. If any one of these indications is abnormal, notify an organizational maintenance technician.

(3) The 400-cycle ac power required for computer operation is applied through the acquisition power control panel (fig. 19) of the director station group. Consequently, certain ac checks and adjustments are prerequisite to the application of power to components of the computer system.

Table VI (U). Application of Power—"Shutdown" to "Computer Standby" for the Computer System

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
				Prerequisites: *a.* Check that 400-cycle engine-driven generators are energized. *b.* Check engine - driven generators to see that frequency is within specified limits and that magnitude of output voltage can be controlled remotely. ***Caution:*** **Damage to or failure of the equipment may result from energizing the equipment when the frequency or voltage is out of tolerance.**		
	Director station group				A, 16 and 19	
1	Acquisition power control panel	PHASE switch	C		70	W
2	Acquisition power control panel	ADJUST PHASE C knob	Turn knob until LINE VOLTS meter (U, fig. 70) indicates 120 volts.	*Note.* The VOLTS ADJ switch (C, fig. 71) is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine-driven generators are employed. When only one generator is used, line voltage adjustments must be made in the trailer mounted tracking station, using the ADJUST PHASE C knob (E, fig. 88) on the radar power control panel. When more than one engine-driven generator is used, line voltage adjustments may be made in either trailer, provided the VOLTS ADJ switch is locked in IN.	70	X

Table VI (U). Application of Power—"Shutdown" to "Computer Standby" for the Computer System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
3	Acquisition power control panel	PHASE switch	A	LINE VOLTS meter should indicate 117.5 to 122.5 volts.	70	W
4	Acquisition power control panel	PHASE switch	B	LINE VOLTS meter should indicate 117.5 to 122.5 volts.	70	W
5	Acquisition power control panel	PHASE switch	C	This returns switch to proper setting for monitoring purposes.	70	W
6	Acquisition power control panel	MAIN POWER switch	ON	*a.* Makes three-phase power available to the acquisition radar and computer system. *b.* Supplies power to the recorder group (A, fig. 16), personnel heater, equipment cooling cabinet assembly, trailer lighting equipment (figs. 30 and 30.1) and 110-volt ac outlets (A and B, fig. 16) in the trailer mounted director station. *c.* Supplies power to personnel heater (A, fig. 31), trailer lighting equipment (A, fig. 38) and 110-volt ac outlets (A and B, fig. 31) in the trailer mounted tracking station. *d.* Supplies power to the 110-volt ac outlets in the missile and target track antenna-receiver-transmitter groups (fig. 49). *e.* All ivory tactical control indicator lights in the trailer mounted director station and the trailer mounted tracking station illuminate.	70	GG
	Computer power supply:				B, 16 and 27	
7	Computer power control panel	COMPUTER POWER switch	ON	*a.* Applies ac power to computer system. *b.* The three COMPUTER POWER ON indicator lights (BB, fig. 83) illuminate. TEST indicator light (B, fig. 84) on the computer control-panel (fig. 28) and the COMPUTER-TEST indicator light (P, 1, fig. 78) on the tactical control-indicator (fig. 24) also illuminate.	83	Z

Table VI (U). Application of Power—"Shutdown" to "Computer Standby" for the Computer System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
7				*c.* Energizes 20-30-second delay timer. After the 20-to 30-second time delay has expired INTLK READY indicator light (Y, fig. 83) illuminates. *d.* The horizontal plotting board (fig. 24) and altitude plotting board light circuits and dial light circuits of the servo computer assembly (fig. 28) are energized. The intensity of the lights can be adjusted by using the following controls: *Control* — *Lights* SERVO LIGHTS knob (NN, fig. 84) — DIAL lights of servo-computer assembly PLOTTING LIGHTS-HORIZONTAL knob (G, 1, fig. 78) — Horizontal plotting board PLOTTING LIGHTS-ALTITUDE knob (H, 1, fig. 78) — Altitude plotting board *Note.* Await illumination of INTLK READY indicator light (Y, fig. 83) before positioning PLATE VOLTS switch (X, fig. 83) to ON.		
8	Computer power control panel	PLATE VOLTS switch	ON	*a.* Applies dc plate voltage to components of computer system. *b.* PLATE VOLTS indicator light (W, fig. 83) illuminates, and INTLK READY indicator light Y, fig. 83) extinguishes. *c.* Energizes computer system standby interval timer inside upper compartment of computer power supply group. This interval timer cycles every 10 minutes. When PLATE VOLTS switch is first placed in ON position, the following sequence takes place: ac	83	X

Table VI (U). Application of Power—"Shutdown" to "Computer Standby" for the Computer System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
8				voltage is applied to zero-set switches. Depending on portion of cycle completed when PLATE VOLTS switch was last turned to off (down) position, zero-set switches are energized within ½ to 10½ minutes. Thereafter, zero-set switches are energized ½ minute during each cycle. *d.* The 10 AMPLIFIER UNBALANCE indicator lights (CC-MM, fig. 84) flicker for a short period. Thereafter, the indicator lights should extinguish *e.* MISSILE SPEED meter (F, 1, fig. 78) on tactical control-indicator indicates between 350 and 410 knots. *f.* PRESENT TARGET ALTITUDE meter (E, 1, fig. 78) indicates target altitude data from the computer.		
9	Computer power control panel	SERVO DC switch	ON	*a.* SERVO DC indicator light (U, fig. 83) illuminates. *b.* Applies +270 volts dc to circuits of computer system provided the standby interval timer is in energized cycle.	83	V
	Servo computer assembly				B, 16 and 28	
10	Computer control panel	COMPUTER CONDITION switch	ACTION	ACTION indicator light (A, fig. 84) illuminates, and TEST indicator light (B, fig. 84) extinguishes. COMPUTER-TEST indicator light (P, 1, fig. 78) on tactical control-indicator (fig. 24) extinguishes.	84	PP
	Computer power supply group:					
11	Computer power control panel	VOLTS CHECK switch	Turn switch in clockwise direction to each marked voltage in succession.	*a.* Permits selection of dc power supply voltages to be checked on VOLTS CHECK meter (B, fig. 83).	83	AA

Table VI (U). Application of Power—"Shutdown" to "Computer Standby" for the Computer System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
11				*b.* At each position of switch, the pointer on the VOLTS CHECK meter should rise to the meter segment shown in listing below. *Note.* If pointer falls outside limits of marks, malfunction causing incorrect meter reading must be corrected by organizational maintenance technician before system can be operated. *Switch position* — *Meter segment* OFF — 0 ADJUST −320A — ¾ ADJUST +320A — ¾ ADJUST −320B — ¾ ADJUST +320B — ¾ −320A — ¾ −320B — ¾ −250 — ¾ −200A — ¾ −200B — ¾ −28 — ¼ +75 — ½ +250 — ¾ +270 — ½ +320A — ¾ +320B — ¾		
12	Computer power control panel	VOLTS CHECK switch	OFF		83	AA
	Servo computer assembly:				B, 16 and 28	
13	Computer control panel	COMPUTER CONDITION switch	STANDBY	ACTION indicator light (A, fig. 84) extinguishes and TEST indicator light (B, fig. 84) illuminates. COMPUTER-TEST indicator light (P, 1, fig. 78) on the tactical control-indicator (fig. 24) illuminates. *Note.* Normally, computer system is completely stabilized within 30 minutes after it is placed in standby condition. If time permits, repeat above voltage checks 30 minutes after the computer is placed in standby condition.	84	PP

c. Application of Power—"Computer Standby" to "Operate". To transfer the computer system from "computer standby" to "operate" condition, perform the steps in table VII in the sequence given.

Table VII (CMHA). Application of Power—"Computer Standby" to "Operate"—Computer System

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
	Trailer mounted director station					
	Servo computer assembly				B, 16 and 28	
1	Computer control panel	COMPUTER CONDITION switch	ACTION	*a.* ACTION indicator light (A, fig. 84) illuminates.	84	PP
				b. TEST indicator light (B, fig. 84) on the computer control-panel, and COMPUTER-TEST indicator light (P, 1, fig. 78) on the tactical control-indicator (fig. 24) extinguish.		
				c. The BALLISTICS EL dial (C, fig. 85), TIME TO INTERCEPT dial (B, fig. 85), and GYRO AZIMUTH dial (D, fig. 85) indicate values different from those indicated in the standby condition due to the introduction of launcher from target radar parallax. Indications depend on amount of parallax set in.	84	PP
				d. Observe that plotting pens on horizontal plotting board and altitude plotting board assume positions listed in (1) through (4) below. (1) The left plotting pen (fig. 129) of the horizontal plotting board comes to rest at 4800 mils azimuth and approximately 1 inch inside the 200,000-yard range circle. (2) The right plotting pen (fig. 129) of the horizontal plotting board comes to rest on the 1600 mils azimuth line and approximately 1 inch inside the 200,000-yard range circle.		

Table VII (CMHA). Application of Power—"Computer Standby" to "Operate"—Computer System—Continued

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
1				*Note.* (1) and (2) above occur only if plotting board condition switch (G, 2, fig. 78) is set to STANDBY. (3) The left plotting pen (fig. 130) on the altitude plotting board assumes a position on the 0 altitude line approximately 0.5 inch in from the left 200-second mark. (4) The right plotting pen (fig. 130) on the altitude plotting board assumes a position on the 0 altitude line approximately 0.5 inch in from the right 200-second mark. *e.* Check that AMPLIFIER UNBALANCE indicator lights (CC through MM, fig. 84) extinguish shortly after COMPUTER CONDITION switch is set to the ACTION position.		
2	Computer power supply group Computer power control panel	VOLTS CHECK switch	Turn switch in clockwise direction to each marked voltage in succession.	*a.* Permits selection of dc power supply voltages to be checked on VOLTS CHECK meter (B, fig. (83). *b.* At each position of switch, the pointer on the VOLTS CHECK meter should rise to the meter segment shown in listing below. *Note.* If pointer falls outside limits of marks, malfunction causing incorrect meter reading must be corrected by organizational maintenance technician before system can be operated.	B, 16 and 27 83	AA

Table VII (CMHA). Application of Power—"Computer Standby" to "Operate"—Computer System—Continued

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
2				*Switch position* — *Meter segment* OFF — 0 ADJUST −320A — ¾ ADJUST +320A — ¾ ADJUST −320B — ¾ ADJUST +320B — ¾ −320A — ¾ −320B — ¾ −250 — ¾ −200A — ¾ −200B — ¾ −28 — ¼ +75 — ½ +250 — ¾ +270 — ½ +320A — ¾ +320B — ¾		
3	Computer power control panel	VOLTS CHECK switch	OFF		83	AA
4	Computer power control panel			Check that all fuse indicator lights (fig. 83) are extinguished.		

107 (U). Energizing the Multichannel Data Recorder

a. General. The RECORD-VIEW switch (K, fig. 72) and the OPERATE-TEST switch (N, fig. 72) permit the multichannel data recorder (fig. 23) to be energized by three different methods: the signal recording method, the alternate signal-recording method, and the test method. The signal-recording method is preferred during an engagement. When this method is used, the multichannel data recorder automatically begins recording when an engagement reaches the red alert status provided target has been designated. The alternate signal-recording method is used to energize the multichannel data recorder during an alert status other than red. The test method of energizing is provided to make calibration checks and adjustments of the recorder group. The multichannel data recorder is only partially energized in the test mode of operation.

b. Application of Power—Signal-Recording Method. To energize the multichannel data recorder using the signal-recording method, perform the steps in table VIII in the sequence given.

Table VIII (U). Application of Power—Multichannel Data Recorder—Signal Recording Method

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
				Prerequisites: *a.* Check that 400-cycle engine-driven generators are operating. *b.* Check engine-driven generators to see that frequency is within specified limits and that magnitude of output voltage can be remotely controlled.		

Table VIII (U). Application of Power—Multichannel Data Recorder—Signal Recording Method—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
				Caution: **Damage to or failure of the equipment may result from energizing the equipment when the frequency or voltage is out of tolerance.**		
	Director station group				A, 16 and 19	
1	Acquisition power control panel	PHASE switch	C		70	W
2	Acquisition power control panel	ADJUST PHASE C knob	Turn until LINE VOLTS meter (U, fig. 70) indicates 120 volts.	*Note.* The VOLTS ADJ switch is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine driven generators are employed. When only one generator is used, line voltage adjustments must be made in the trailer mounted tracking station using the ADJUST PHASE C knob (E, fig. 88) on the radar power control panel. When more than one engine-driven generator is used, line voltage adjustments may be made in either trailer, provided the VOLTS ADJ switch is locked in IN.	70	X
3	Acquisition power control panel	PHASE switch	A	LINE VOLTS meter (U, fig. 70) should indicate 117.5 to 122.5 volts.	70	W
4	Acquisition power control panel	PHASE switch	B	LINE VOLTS meter (U, fig. 70) should indicate 117.5 to 122.5 volts.	70	W
5	Acquisition power control panel	PHASE switch	C	Returns switch to proper setting for monitoring purposes.	70	W
6	Acquisition power control panel	MAIN POWER switch	ON	*a.* Makes 3-phase power available to the acquisition radar system and the computer system. *b.* Supplies power to the recorder group (A, fig. 16), personnel heater, equipment cooling cabinet assembly, trailer lighting equipment (figs. 30 and 30.1), and 110-volt ac outlets (A and B, fig. 16) in the trailer mounted director station. *c.* Supplies power to personnel heater (A, fig. 31), trailer lighting equipment (fig. 38) and 110-volt ac outlets (A and B, fig. 31) in the trailer mounted tracking station. *d.* POWER-D. C. indicator light (E, fig. 72) on the multichannel data recorder illuminates.	70	GG

Table VIII (U). Application of Power—Multichannel Data Recorder—Signal Recording Method—Continued

Step	Location	Control	Control setting	Remarks	Reference: Figure	Reference: Key
6				*e.* POWER-400∼indicator light (D, fig. 72) on the multichannel data recorder illuminates.		
	Recorder group				A, 16 and 23	
7	Multichannel data recorder	Shutter knob	Fully clockwise	Closes shutter (Q, fig. 72).	72	M
8	Multichannel data recorder	RECORD-VIEW switch	RECORD	VIEW indicator light (J, fig. 72) extinguishes provided the OPERATE-TEST switch (N, fig. 72) is set to TEST.	72	K
9	Multichannel data recorder	Film footage counter		Check for adequate supply of recording paper. The END OF PAPER indicator light (B, fig. 73) on the fuse and control panel (fig. 23) should be extinguished if more than 25 feet of recording paper is in the cylindrical supply drum.	72	R
10	Multichannel data recorder	OPERATE-TEST switch	OPERATE	*Note.* The recorder is now ready for operation. Upon receipt of a red alert status and a target designated signal the recorder is automatically energized and operates until a lower alert status is established.	72	N

c. Application of Power—Alternate Signal-Recording Method. To energize the multichannel data recorder using the alternate signal-recording method, perform the steps in table IX in the sequence given.

Table IX (U). Application of Power—Multichannel Data Recorder—Alternate Signal-Recording Method

Step	Location	Control	Control setting	Remarks	Reference: Figure	Reference: Key
				Prerequisites: *a.* Check that 400-cycle engine-driven generators are operating. *b.* Check engine-driven generators to make certain that frequency is within specified limits and that magnitude of output voltage can be remotely controlled. *Caution:* **Damage to or failure of the equipment may result from energizing the equipment when the frequency or voltage is out of tolerance.**		

Table IX (U). Application of Power—Multichannel Data Recorder—Alternate Signal-Recording Method—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
	Director station group				A, 16 and 19	
1	Acquisition power control panel	PHASE switch	C	*Note.* The VOLTS ADJ switch is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine-driven generators are employed. When only one generator is used, line voltage adjustments must be made in the trailer mounted tracking station, using the ADJUST PHASE C knob (E, fig. 88) on the radar power control panel. When more than one engine-driven generator is used, line voltage adjustments may be made in either trailer, provided the VOLTS ADJ switch is locked in IN.	70	W
2	Acquisition power control panel	ADJUST PHASE C knob	Turn until LINE VOLTS meter (U, fig. 70) indicates 120 volts.		70	X
3	Acquisition power control panel	PHASE switch	A	LINE VOLTS meter (U, fig. 70) should indicate 117.5 to 122.5 volts.	70	W
4	Acquisition power control panel	PHASE switch	B	LINE VOLTS meter (U, fig. 70) should indicate 117.5 to 122.5 volts.	70	W
5	Acquisition power control panel	PHASE switch	C	Returns switch to proper setting for monitoring purposes.		
6	Acquisition power control panel	MAIN POWER switch	ON	*a.* Makes 3-phase power available to the acquisition radar system and the computer system. *b.* Supplies power to the recorder group (A, fig. 16), personnel heater, equipment cooling cabinet assembly, trailer lighting equipment (figs. 30 and 30.1), and 110-volt ac outlets (A and B fig. 16) in the trailer mounted director station. *c.* Supplies power to personnel heater (A, fig. 31), trailer lighting equipment (A, fig. 38) and 110-volt ac outlets (A and B, fig. 31) in the trailer mounted tracking station. *d.* POWER-D. C. indicator light (E, fig. 72) on the multichannel data recorder illuminates. *e.* POWER-400-~ indicator light (D, fig. 72) on the multichannel data recorder illuminates.	70	GG

Table IX (U). Application of Power—Multichannel Data Recorder—Alternate Signal-Recording Method—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
	Recorder group				A, 16 and 23	
7	Multichannel data recorder	Shutter knob	Fully clockwise	Closes shutter (Q, fig. 72).	72	M
8	Multichannel data recorder	RECORD-VIEW switch	RECORD	VIEW indicator light (J, fig. 72) extinguishes.	72	K
9	Multichannel data recorder	Film footage counter		Check for adequate supply of recording paper. The END OF PAPER indicator light (B, fig. 73) on the fuse and control panel (fig. 23) should be extinguished if more than 25 feet of recording paper is in the cylindrical supply drum.	72	R
10	Multichannel data recorder	OPERATE-TEST switch	TEST	*a.* Applies necessary voltages to energize multichannel data recorder. *b.* Check that there are 16 dots present on the direct trace monitoring screen (A, fig. 72). *c.* MOTOR ON indicator light (L, fig. 72) illuminates. *Note.* If LAMP FAILURE-T indicator light (F, fig. 72), LAMP FAILURE-1 indicator light (G, fig. 72), or LAMP FAILURE-2 indicator light (H, fig. 72) illuminates a galvanometer lamp has failed. An organizational maintenance technician should be notified. *d.* REC ON indicator light (A, fig. 73) on the fuse and control panel (fig. 23) illuminates. *e.* The RECORD NUMBER counter (B, fig. 72) advances one number approximately 3 seconds after the OPERATE-TEST switch is set to TEST.	72	N

d. Application of Power—Test Method. To energize the multichannel data recorder using the test method, perform the steps in table X in the sequence given.

Table X (U). Application of Power—Multichannel Data Recorder—Test Method

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
				Prerequisites: *a.* Check that 400-cycle engine-driven generators are operating. *b.* Check engine-driven generators to see that frequency is within specified limits and that magnitude of output voltage can be controlled remotely. *Caution:* **Damage to or failure of the equipment may result from energizing the equipment when the frequency or voltage is out of tolerance.**		
	Director station group				A, 16 and 19	
1	Acquisition power control panel	PHASE switch	C		70	W
2	Acquisition power control panel	ADJUST PHASE C knob	Turn until LINE VOLTS meter (U, fig. 70) indicates 120 volts	*Note.* The VOLTS ADJ switch is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine-driven generators are employed. When only one generator is used, line voltage adjustments must be made in the trailer mounted tracking station, using the ADJUST PHASE C knob (E, fig. 88) on the radar power control panel. When more than one engine-driven generator is used, line voltage adjustments may be made in either trailer, provided the VOLTS ADJ switch is locked in IN.	70	X
3	Acquisition power control panel	PHASE switch	A	LINE VOLTS meter (U, fig. 70) should indicate 117.5 to 122.5 volts.	70	W
4	Acquisition power control panel	PHASE switch	B	LINE VOLTS meter (U, fig. 70) should indicate 117.5 to 122.5 volts.	70	W
6	Acquisition power control panel	MAIN POWER switch	ON	*a.* Makes 3-phase power available to the acquisition radar system and the computer system. *b.* Supplies power to the recorder group (A, fig. 16), personnel heater, equipment cooling cabinet assembly, trailer lighting equipment (figs. 30 and 30.1), and 110-volt ac outlets (A and B, fig. 16) in the trailer mounted director station.	70	GG

Table X (U). Application of Power—Multichannel Data Recorder—Test Method—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
6				*c.* Supplies power to personnel heater (A, fig. 31), trailer lighting equipment (A, fig. 38) and 110-volt ac outlets (A and B, fig. 31) in the trailer mounted tracking station. *d.* POWER—D. C. indicator light (E, fig. 72) on the multichannel data rerecorder illuminates. *e.* POWER—400-~ indicator light (D, fig. 72) on the multichannel data recorder illuminates.		
	Recorder group				A, 16 and 23	
7	Multichannel data recorder	RECORD-VIEW switch	VIEW	Permits shutter (Q, fig. 72) to be opened.	72	K
8	Multichannel data recorder	Shutter knob	Fully counterclockwise	Opens shutter (Q, fig. 72).	72	M
9	Multichannel data recorder	OPERATE-TEST switch	TEST	*a.* VIEW indicator light (J, fig. 72) illuminates. *b.* Partially energizes the multichannel data recorder by applying −28 volts dc to control circuits. *c.* The RECORD NUMBER counter (B, fig. 72) advances one number approximately 3 seconds after OPERATE-TEST switch is set to TEST. *d.* Check that 16 dots are present on the direct trace monitoring screen (A, fig. 72). *e.* Observe galvanometer traces (white dots) on calibrated adjustment screen by looking through open shutter (Q, fig. 72). *Note.* If LAMP FAILURE—T indicator light (F, fig. 72), LAMP FAILURE—1 indicator light (G, fig. 72), and LAMP FAILURE—2 indicator light (H, fig. 72) illuminates a galvanometer lamp has probably failed. An organizational maintenance technician should be notified. *Note.* The multichannel data recorder is energized for testing. Calibration checks and adjustments can now be performed on the multichannel data recorder.	72	N

108 (U). Energizing Target Tracking Radar System

a. Position of Controls Prior to Energizing. The procedure for energizing the target tracking radar system requires that certain controls be adjusted or placed in a particular position prior to energizing the system. Prior positioning of controls as given in table XI is necessary to insure that the application of power is controlled by the proper step-by-step energizing procedure to prevent possible damage to the equipment. Frequently the controls are already set in the desired position. Controls not given in the table need not be preset, since they do not directly affect the energizing procedure.

Table XI (CMHA). Position of Controls Prior to Energizing—Target Tracking Radar System

Location	Control	Control setting	Reference	
			Figure	Key
		Note. Prior to operation, all cabinet doors in the trailer mounted director station and the trailer mounted tracking station must be secured to close all interlock switches. *Note.* Upon entering the trailer mounted tracking station, set the BLACKOUT OVERRIDE switch to the on (up) position and set the CEILING LIGHTS switch to REMOTE.		
Acquisition power control panel—rear	VOLTS ADJ switch	IN *Note.* The VOLTS ADJ switch is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine-driven generators are employed. When only one generator is used, line voltage adjustments must be made in the trailer mounted tracking station using the ADJUST PHASE C knob (E, fig. 88) on the radar power control panel. When more than one engine-driven generator is used, line voltage adjustments may be made in either trailer, provided the VOLTS ADJ switch is locked in IN.	71	C
Trailer mounted tracking station	EQUIPMENT COOLING INTAKE cover	Open		
	EQUIPMENT COOLING EXHAUST cover	Open		
Target track antenna-receiver-transmitter group			49	
Target track antenna-receiver-transmitter group	Azimuth antirotational lock	Disengaged	110	B, 2
Target track antenna-receiver-transmitter group	Elevation antirotational lock	Disengaged	110	A, 2
Target track antenna-receiver-transmitter group	BLOWER switch	ON	110	A, 1
Azimuth drive equipment enclosure	ANTENNA DISABLE switch	NORMAL	111	A
Radar power supply group			A, 31 and 33	
Radar power control panel—rear	EQPT VENT switch	On (up)	90	A

Table XI (CMHA). Position of Controls Prior to Energizing—Target Tracking Radar System—Continued

Location	Control	Control setting	Reference Figure	Reference Key
Radar power supply group—Continued				
Radar power control panel	BATTLE SHORT switch	Off (down) (protective cover must be down and safety wired).	88	A
Radar power control panel	MAIN POWER switch	Off (down) *Note.* This switch should be left in the ON position if the missile tracking radar system is energized and is to remain energized.	88	R
Radar power control panel	MISSILE POWER switch	Off (down) *Note.* This switch should be left in the ON position if the missile tracking radar system is energized and is to remain energized.	88	Q
Radar power control panel	TARGET POWER switch	Off (down)	88	S
Radar power control panel	TARGET-PLATE VOLTS switch	OFF	88	Y
Radar power control panel	VOLTS CHECK-MISSILE switch	TARGET	88	CC
Radar power control panel	VOLTS CHECK-TARGET switch	OFF	88	BB
Target radar control console			A, 31 and 34	
Electric light control	DIAL LIGHTS knob	Fully clockwise	97	A
Electric light control	SIGNAL LIGHTS knob	Fully clockwise	97	B
Electric light control	ELEV switch	Down	97	E
Electric light control	AZ switch	Down	97	F
Electric light control	RANGE switch	Down	97	G
Elevation indicator	IMAGE SPACING switch	NOR	98	E
Elevation indicator	INTENSITY knob	Fully counterclockwise	98	B
Elevation indicator	SWEEP LENGTH knob	Fully counterclockwise	98	C
Target track control power supply	HV SUPPLY knob	START (fully counterclockwise)	99	M
Target track control power supply	IND HV switch	OFF	99	G
Target track control power supply	AGC-MANUAL switch	AGC	99	D
Azimuth indicator	IMAGE SPACING switch	NOR	98	E
Azimuth indicator	INTENSITY knob	Fully counterclockwise	98	B
Azimuth indicator	SWEEP LENGTH knob	Fully counterclockwise	98	C
Precision indicator	INTENSITY knob	Fully counterclockwise	94	A
Precision indicator	GAIN knob	Fully counterclockwise	94	B
PPI	INTENSITY knob	Fully counterclockwise	100	B
PPI	GAIN knob	Fully counterclockwise	100	C

Table XI (CMHA). Position of Controls Prior to Energizing—Target Tracking Radar System—Continued

Location	Control	Control setting	Reference	
			Figure	Key
Target radar control console—Continued				
PPI	RANGE switch	250,000	100	E
Range indicator	IMAGE SPACING switch	OFF	98	E
Range indicator	INTENSITY knob	Fully counterclockwise	98	B
Range indicator	SWEEP LENGTH knob	Fully counterclockwise	98	C
Target track control drawer	Azimuth MAN-AID-AUTO switch	MAN	96	D
Target track control drawer	SERVOS switch	Off (center)	96	R
Target track control drawer	TEST-NORMAL switch	NORMAL	96	J
Target track control drawer	Range MAN-AID-AUTO switch	MAN	96	L
Target track control drawer	RANGE switch	NORMAL	96	M
Target track control drawer	Elevation MAN-AID-AUTO switch	MAN	96	A

b. Application of Power—"Shutdown" to "Low Voltage." To place the target tracking radar system in the "low voltage" condition, perform the steps in table XII in the sequence given.

Table XII (U). Application of Power—"Shutdown" to "Low Voltage"—Target Tracking Radar System

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
				Prerequisites: *a.* Check that 400-cycle engine-driven generators are operating. *b.* Check engine-driven generators to see that frequency is within specified limits and that magnitude of output voltage can be remotely controlled. *Caution:* **Damage to or failure of the equipment may result from energizing the equipment when the frequency or voltage is out of tolerance.**		

Table XII (U). Application of Power—"Shutdown" to "Low Voltage"—Target Tracking Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
	Radar power supply group				A, 31 and 33	
1	Radar power control panel	PHASE switch	C		88	F
2	Radar power control panel	ADJUST PHASE C knob	Turn knob until LINE VOLTS meter (C, fig. 88) indicates 120 volts	*Note.* The VOLTS ADJ switch (C, fig. 71) in the trailer mounted director station is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine-driven generators are employed. When only one generator is used, line voltage adjustments must be made in the trailer mounted tracking station, using the ADJUST PHASE C knob (E, fig. 88) on the radar power control panel. When more than one engine-driven generator is used, line voltage adjustments may be made in either trailer, provided the VOLTS ADJ switch is locked in IN.	88	E
3	Radar power control panel	PHASE switch	A	LINE VOLTS meter (C, fig. 88) should indicate 117.5 to 122.5 volts.	88	F
4	Radar power control panel	PHASE switch	B	LINE VOLTS meter (C, fig. 88) should indicate 117.5 to 122.5 volts.	88	F
4.1	Radar power control panel	PHASE switch	C	Returns switch to proper setting for monitoring purposes.	88	F
5	Radar power control panel	MAIN POWER switch	ON	*a.* Makes 3-phase power available to the target- and missile-tracking radar systems. *b.* Energizes all blowers in the target and missile track antenna-receiver-transmitter groups. *c.* Energizes radome inflation blower, provided the BLOWER switch (A, 1, fig. 110) is set to ON.	88	R

Table XII. Application of Power—"Shutdown" to "Low Voltage"—Target-Tracking Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Fig.	Reference Key
				d. Energizes equipment cooling fan (fig. 18) provided EQUIP VENT switch (A, fig. 90) on the rear of the radar power control panel is set to the ON position. *e.* Makes power available to radar test set TS–847A/MSW–1 (fig. 53).		
6	Radar power control panel.	TARGET POWER switch.	ON	*a.* Applies filament voltage to target-tracking radar system. *b.* TARGET-HIGH VOLTS-PREHEAT indicator light (W, fig. 88) illuminates. *c.* Energizes target 20-second delay timer. After 20 to 24 seconds expire, TARGET-PLATE VOLTS-READY indicator light (Z, fig. 88) illuminates. *d.* Energizes target 5-minute delay timer. After 5 minutes have expired, TARGET-HIGH VOLTS-HOT indicator light (V, fig. 88) illuminates. *e.* Dial lights at target radar control console (fig. 34) illuminate. Target range dial (B, fig. 102) on the radar set group (fig. 35) also illuminates. *Note.* When TARGET-PLATE VOLTS READY indicator light (Z, fig. 88) illuminates, continue with steps 7, 8, and 9 below.	88	S
7	Radar power control panel.	TARGET-PLATE VOLTS switch.	On (up)	*a.* Applies plate voltage to target-tracking radar system. *b.* TARGET-PLATE VOLTS-ON indicator light (X, fig. 88) illuminates.	88	Y

Table XII. Application of Power—"Shutdown" to "Low Voltage"—Target-Tracking Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Fig.	Reference Key
				c. TARGET-PLATE VOLTS-READY indicator light (Z, fig. 88) extinguishes. *d.* TARGET-HIGH VOLTS-READY indicator light (U, fig. 88) on the radar power control panel illuminates, and HV SUPPLY-READY indicator light (L, fig. 99) on the target track control power supply (fig. 34) illuminates, provided TARGET-HIGH VOLTS-HOT indicator light (V, fig. 88) is already illuminated, indicating that the 5-minute timer interval has expired. *e.* FREQUENCY meter (B, fig. 99) on the target track control power supply (fig. 34) indicates relative frequency of the magnetron.		
8	Radar power control panel.	VOLTS CHECK-TARGET switch.	Turn switch clockwise to each of marked voltages in succession.	*a.* Permits selection of dc voltages to be checked on VOLTS CHECK meter (B, fig. 88), provided VOLTS CHECK-MISSILE switch (CC, fig. 88) is set to the TARGET position. *b.* At each position of the switch the meter pointer should rise to the meter segment shown in the listing below. *Note.* If the pointer falls outside the limits of a particular segment or fluctuates excessively, the malfunction causing the incorrect meter reading must be corrected by an organizational-maintenance technician before the system can be operated.	88	BB

Table XII (U). Application of Power—"Shutdown" to "Low Voltage"—Target Tracking Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
				Switch position / *Meter segment* OFF — −250A ¾ −320A ¾ +150A ¾ +220A ¾ +250A ¾ +320A ¾ +150C ¾ +250C ¾ +320C ¾ +450 ¾ +270 ½ −28A ¼		
9	Radar power control panel	VOLTS CHECK-TARGET switch	OFF	*Note.* The target tracking radar system is now in a Low Voltage condition.	88	BB

c. Application of Power—"Low Voltage" to "Operate". To transfer the target tracking radar system from "low voltage" to "operate" condition, perform the steps in table XIII in the sequence given.

Table XIII (CMHA). Application of Power—"Low Voltage" to "Operate"—Target Tracking Radar System

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
	Trailer mounted tracking station Radar power supply group				A, 31 and 33	
1	Radar power control panel	VOLTS CHECK-TARGET switch	Turn switch clockwise to each of marked voltages in succession.	*a.* Permits selection of dc voltages to be checked on VOLTS CHECK meter (B, fig. 88). *b.* At each position of the switch, the meter pointer should rise to the meter segment shown in the listing below, provided VOLTS CHECK-MISSILE switch is in TARGET position. *Note.* If the pointer falls outside the limits of a particular segment or fluctuates excessively the malfunction causing the incorrect meter reading must be corrected by an organizational maintenance technician before the system can be operated.	88	BB

Table XIII (CMHA). Application of Power—"Low Voltage" to "Operate"—Target Tracking Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
				Switch position — *Meter segment* OFF — — −250A — ¾ −320A — ¾ +150A — ¾ +220A — ¾ +250A — ¾ +320A — ¾ +150C — ¾ +250C — ¾ +320C — ¾ +450 — ¾ +270 — ½ −28A — ¼		
2	Radar power control panel	VOLTS CHECK-TARGET switch	OFF		88	BB
	Target radar control console				A, 31 and 34	
3	Target track control power supply	IND HV switch	On (up)	Applies high voltage to elevation indicator (fig. 34), azimuth indicator, range indicator, PPI and precision indicator. IND HV indicator light (F, fig. 99) illuminates.	99	G
4	Target track control power supply	HV SUPPLY-ON switch	Depress	*a.* Applies high voltage to transmitter system of the target tracking radar system. *b.* The HV SUPPLY-ON indicator light (J, fig. 99) illuminates, and the HV SUPPLY-READY indicator light (L, fig. 99) extinguishes. *c.* The TARGET-HIGH VOLTS-ON indicator light (T, fig. 88), illuminates and the following indicator lights extinguish: (1) TARGET-INTLK indicator light (AA, fig. 88). (2) TARGET-HIGH VOLTS-PREHEAT indicator (W, fig. 88). (3) TARGET-HIGH VOLTS-HOT indicator light (V, fig. 88). (4) TARGET-HIGH VOLTS-READY indicator light (U, fig. 88).	99	H

Table XIII (CMHA). Application of Power—"Low Voltage" to "Operate"—Target Tracking Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
5	Target track control power supply	HV SUPPLY knob	Turn smoothly clockwise from START position until 3 milliamperes of current is indicated on the upper scale of MAGNETRON meter (A, fig. 99).	*Caution:* **Do not force knob beyond mechanical stops. If fluctuation is sufficient to actuate the overcurrent sensing device, causing HV SUPPLY-ON indicator light (J, fig. 99) to extinguish, turn knob counterclockwise to START and notify an organizational maintenance technician.** *Note.* The magnetron switch (N, fig. 99) must be in the center position (FS 5MA) for adjustment specified in step 5.	99	M
6	PPI	RANGE switch	250,000	This position is used to obtain the best definition at maximum range on PPI.	100	E
7	PPI	INTENSITY knob	Turn clockwise until rotating radial sweep (C, fig. 113) on PPI is barely visible.		100	B
8	PPI	GAIN knob	Turn clockwise to obtain clear presentation of acquisition reference marks (fig. 113) on PPI.		100	C
9	Precision indicator	INTENSITY knob	Turn clockwise until sweep (B, fig. 115) on precision indicator (fig. 34) presentation is clearly visible.	*Note.* If a back sweep is visible on precision indicator, turn the INTENSITY knob counterclockwise until only the normal sweep appears.	94	A
10	Precision indicator	GAIN knob	Turn clockwise to obtain maximum display definition.		94	B
11	Azimuth indicator	INTENSITY knob	Turn clockwise until azimuth indicator presentation is clearly visible.		98	B

Table XIII (CMHA). Application of Power—"Low Voltage" to "Operate"—Target Tracking Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
12	Azimuth indicator	FOCUS knob	Turn clockwise or counterclockwise to obtain a clearly defined azimuth indicator presentation.		98	A
13	Range indicator	INTENSITY knob	Turn clockwise until range indicator presentation is clearly visible.		98	B
14	Range indicator	FOCUS knob	Turn clockwise or counterclockwise to obtain a clearly defined range indicator presentation.		98	A
15	Elevation indicator	INTENSITY knob	Turn clockwise until elevation indicator presentation is clearly visible.		98	B
16	Elevation indicator	FOCUS knob	Turn clockwise or counterclockwise to obtain a clearly defined elevation indicator presentation.	*Note.* The target tracking radar system is now in an "Operate" condition and is ready for an engagement.	98	A

109 (U). Energizing the Missile Tracking Radar System

a. Position of Controls Prior to Energizing. The procedure for energizing the missile tracking radar system requires that certain controls be adjusted or placed in a particular position prior to energizing the system. Prior positioning of controls as given in table XIV is necessary to insure that the application of power is controlled by the proper step-by-step energizing procedure to prevent possible damage to the equipment. Controls not given in the table need not be preset, since they do not directly affect the energizing procedure.

Table XIV (U). Position of Controls Prior to Energizing—Missile Tracking Radar System

Location	Control	Control setting	Reference Figure	Reference Key
		Note. Prior to operation, all cabinet doors in the trailer mounted director station and the trailer mounted tracking station must be secured to close all interlock switches. *Note.* Upon entering the trailer mounted tracking station, set the BLACKOUT OVERRIDE switch to the on (up) position and set the CEILING LIGHTS switch to REMOTE.		

Table XIV (U). Position of Controls Prior to Energizing—Missile Tracking Radar System—Continued

Location	Control	Control setting	Reference	
			Figure	Key
Trailer mounted director station				
Acquisition power control panel	VOLTS ADJ switch	IN *Note.* The VOLTS ADJ switch is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine-driven generators are employed. When only one generator is used, line voltage adjustments must be made in the trailer mounted tracking station, using the ADJUST PHASE C knob (E, fig. 88) on the radar power control panel. When more than one engine-driven generator is used, line voltage adjustments may be made in either trailer, provided the VOLTS ADJ switch is locked in IN.	71	C
Trailer mounted tracking station	EQUIPMENT COOLING INTAKE cover	Open		
	EQUIPMENT COOLING EXHAUST cover	Open		
Missile track antenna-receiver-transmitter group			49	
Missile track antenna-receiver-transmitter group	Azimuth antirotational lock	Disengaged	110	B, 2
Missile track antenna-receiver-transmitter group	Elevation antirotational lock	Disengaged	110	A, 2
Missile track antenna-receiver-transmitter group	BLOWER switch	ON	110	A, 1
Azimuth drive equipment enclosure	ANTENNA DISABLE switch	NORMAL	111	A
Radar power supply group			A, 31, and 33	
Radar power control panel—rear	EQPT VENT switch	On (up)	90	A
Radar power control panel	BATTLE SHORT switch	Off (down) (protective cover must be down and safety wired).	88	A
	MAIN POWER switch	Off (down) *Note.* This switch should be left in the ON position if the target tracking radar system is energized and is to remain energized.	88	R
Radar power control panel	TARGET POWER switch	Off (down) *Note.* This switch should be left in the ON position if the target tracking radar system is energized and is to remain energized.	88	S
Radar power control panel	MISSILE POWER switch	Off (down)	88	Q
Radar power control panel	MISSILE-PLATE VOLTS switch	OFF	88	M
Radar power control panel	VOLTS CHECK-MISSILE switch	TARGET	88	CC
Radar power control panel	VOLTS CHECK-TARGET switch	OFF	88	BB

Table XIV (U). Position of Controls Prior to Energizing—Missile Tracking Radar System—Continued

Location	Control	Control setting	Reference Figure	Reference Key
Missile radar control console			B, 31 and 36	
Missile track control power supply	HV SUPPLY knob	START (fully counterclockwise)	105	M
Missile track control power supply	IND HV switch	OFF	105	G
Missile track control power supply	AGC-MANUAL switch	AGC	105	D
Range indicator	IMAGE SPACING switch	OFF	107	E
Range indicator	INTENSITY knob	Fully counterclockwise	107	B
Range indicator	SWEEP LENGTH knob	Fully counterclockwise	107	C
Missile track control drawer	SERVOS switch	Off (center)	104	P
Missile track control drawer	RANGE switch	NORMAL	104	D
Missile track control drawer	DISABLE switch	Off (down)	104	M
Missile track control drawer	TEST-NORMAL switch	TEST	104	A
Missile track control drawer	Range MAN-AID-AUTO switch	MAN	104	G
Missile track control drawer	Azimuth MAN-AID-AUTO switch	MAN	104	L
Missile track control drawer	Elevation MAN-AID-AUTO switch	MAN	104	Q
Missile control-indicator group	TARGET-STANDBY-MISSILE switch	STANDBY	106	L
Missile track indicator	MISSILE READY switch	Off (down)	103	H
Missile track indicator	LOCAL DESIGNATE switch	Off (down)	103	J
Missile track indicator	DIAL LIGHTS knob	Fully clockwise	103	L
Missile track indicator	SIGNAL LIGHTS knob	Fully clockwise	103	T

b. Application of Power—"Shutdown" to "Low Voltage." To place the missile tracking radar system to the "low voltage" condition, perform the steps in table XV in the sequence given.

Table XV (U). Application of Power—"Shutdown" to "Low Voltage"—Missile Tracking Radar System

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
				Prerequisites: Check that 400-cycle engine-driven generators are energized. Check engine-driven generators to see that frequency is within specified limits and that magnitude of output voltage can be controlled remotely. *Caution:* **Damage to or failure of the equipment may result from energizing the equipment when the frequency or voltage is out of tolerance.**		
	Radar power supply group				A, 31 and 33	
1	Radar power control panel	PHASE switch	C		88	F

Table XV (U). Application of Power—"Shutdown" to "Low Voltage"—Missile Tracking Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
2	Radar power control panel	ADJUST PHASE C knob	Turn knob until LINE VOLTS meter (C, fig. 88) indicates 120 volts.	*Note.* The VOLTS ADJ switch (C, fig. 71) in the trailer mounted director station is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine-driven generators are employed. When only one generator is used, line voltage adjustments must be made in the trailer mounted tracking station, using the ADJUST PHASE C knob (E, fig. 88) on the radar power control panel. When more than one engine-driven generator is used, line voltage adjustments may be made in either trailer, provided the VOLTS ADJ switch is locked in IN.	88	E
3	Radar power control panel	PHASE switch	A	LINE VOLTS meter (C, fig. 88) should indicate 117.5 to 122.5 volts.	88	F
4	Radar power control panel	PHASE switch	B	LINE VOLTS meter (C, fig. 88) should indicate 117.5 to 122.5 volts.	88	F
4.1	Radar power control panel	PHASE switch	C	Returns switch to proper setting for monitoring purposes.	88	F
5	Radar power control panel	MAIN POWER switch	ON	Makes 3-phase power available to the target and missile tracking radar systems. Energizes all blowers in the target and missile track antenna-receiver-transmitter groups. Energizes radome inflation blower, provided the BLOWER switch (A, 1, fig. 110) is set to the ON position. Energizes the equipment cooling fan (fig. 18) provided EQPT VENT switch (A, fig. 90) on the rear of the radar power control panel is set to the ON position. Makes power available to radar test set TS-847A/MSW-1 (fig. 53). MISSILE-INTLK and TARGET-INTLK indicator lights (P and AA, fig. 88) illuminate.	88	R
6	Radar power control panel	MISSILE POWER switch	ON	Applies filament voltage to the missile tracking radar system. MISSILE-HIGH VOLTS-PRE-HEAT indicator light (K, fig. 88) illuminates.	88	Q

Table XV (U). Application of Power—"Shutdown" to "Low Voltage"—Missile Tracking Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
6				Energizes missile 20-second delay timer. After 20 to 24 seconds have expired, MISSILE-PLATE VOLTS-READY indicator light (N, fig. 88) illuminates. Energizes missile 5-minute delay timer. After 5 minutes have expired, MISSILE-HIGH VOLTS-HOT indicator light (J, fig. 88) illuminates. Dial light at missile radar control console (fig. 36) illuminates. Missile range dial (A, fig. 102) on radar set group (fig. 35) illuminates. *Note.* When the MISSILE-PLATE VOLTS-READY indicator light (N, fig. 88) illuminates, continue with steps 7, 8, and 9 below.		
7	Radar power control panel	MISSILE-PLATE VOLTS switch	On (up)	Applies plate voltage to the missile tracking radar system. MISSILE-PLATE VOLTS-ON indicator light (L, fig. 88) illuminates. MISSILE-PLATE VOLTS-READY indicator light (N, fig. 88) extinguishes. MISSILE-HIGH VOLTS-READY indicator light (H, fig. 88) on the radar power control panel and HV SUPPLY-READY indicator light (L, fig. 105) on the missile track control power supply (fig. 36) illuminate, provided MISSILE-HIGH VOLTS-HOT indicator light (J, fig. 88) is already illuminated indicating that the 5-minute timer interval has expired.	88	M

Table XV. Application of Power—"Shutdown" to "Low Voltage"—Missile-Tracking Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference	
					Fig.	Key
				FREQUENCY meter (B, fig. 105) on the missile track control power supply (fig. 36) indicates relative frequency of magnetron.		
8	Radar power control panel.	VOLTS CHECK-MISSILE switch.	Turn switch clockwise to each of the marked voltages in succession.	Permits selection of dc voltages to be checked on VOLTS CHECK meter (B, fig. 88). At each position of the switch, meter pointer should rise to the meter segment shown in the listing below. *Note.* If the pointer falls outside the limits of a particular segment or fluctuates excessively the malfunction causing the incorrect meter reading must be corrected by an organizational-maintenance technician before the system can be operated. *Switch position* — *Meter segment* TARGET — — −250B — ¾ −320B — ¾ +150B — ¾ +220B — ¾ +250B — ¾ +320B — ¾ +150D — ¾ +250D — ¾ +320D — ¾ +450 — ¾ +270 — ½ −28B — ¼	88	CC
9	Radar power control panel.	VOLTS CHECK-MISSILE switch.	TARGET		88	CC

c. Application of Power—"Low Voltage" to "Operate". To transfer the missile-tracking radar system from "low voltage" to operate condition, perform the steps in table XVI in the sequence given.

Table XVI. Application of Power—"Low Voltage" to "Operate"—Missile-Tracking Radar System

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
	Trailer-mounted tracking station. Missile radar control console.				B, 31, and 36	
1	Radar power control panel.	VOLTS CHECK-MISSILE switch.	Set switch clockwise to each of the marked voltages in succession.	*a.* Permits selection of dc voltages to be checked on VOLTS CHECK meter (B, fig. 88). *b.* At each position of the switch, meter pointer should rise to the meter segment shown in the listing below. *Note.* If the pointer falls outside the limits of a particular segment or fluctuates excessively the malfunction causing the incorrect meter reading must be corrected by an organizational · maintenance technician before the system can be operated. *Switch position* — *Meter segment* TARGET — — −250B — 3/4 −320B — 3/4 +150B — 3/4 +220B — 3/4 +250B — 3/4 +320B — 3/4 +150D — 3/4 +250D — 3/4 +320D — 3/4 +450 — 3/4 +270 — 1/4 −28B — 1/2	88	CC
2	Radar power control panel.	VOLTS CHECK-MISSILE switch.	TARGET		88	CC
3	Missile track control power supply.	IND HV switch	On (up)	Applies high voltage to range indicator (fig. 36). IND HV indicator light (F, fig. 105) illuminates.	105	G

Table XVI (U). Application of Power—"Low Voltage" to "Operate"—Missile Tracking Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
4	Missile track control power supply	HV SUPPLY-ON switch	Depress.	*a.* Applies high voltage to the transmitter system of the missile tracking radar system. *b.* HV SUPPLY-ON indicator light (J, fig. 105) illuminates, and HV SUPPLY-READY indicator light (L, fig. 105) extinguishes. *c.* MISSILE-HIGH VOLTS-ON indicator light (G, fig. 88) on the radar power control panel illuminates and the indicator lights listed in (1) through (4) below extinguish. (1) MISSILE-INTLK indicator light (P, fig. 88). (2) MISSILE-HIGH VOLTS-PREHEAT indicator light (K, fig. 88). (3) MISSILE-HIGH VOLTS-HOT indicator light (J, fig. 88). (4) MISSILE-HIGH VOLTS-READY indicator light (H, fig. 88).	105	H
5	Missile track control power supply	HV SUPPLY knob	Turn smoothly clockwise from START position until MAGNETRON meter (A, fig. 105) indicates 8.5 ma for NIKE-HERCULES operation, or 15 ma for NIKE-AJAX operation.	***Caution:* Do not force knob beyond mechanical stops. If meter pointer fluctuation is sufficient to actuate the overcurrent sensing device, causing the HV SUPPLY-ON indicator light (J, fig 105) to extinguish, turn knob counterclockwise to START and notify an organizational maintenance technician.** *Note.* The MAGNETRON switch (N, fig. 105) must be in the center position (FS 20MA) for adjustment specified in step 5.	105	M
6	Range indicator	INTENSITY knob	Turn clockwise until indicator presentation is clearly visible		107	B

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Table XVI (U). Application of Power—"Low Voltage" to "Operate"—Missile Tracking Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
7	Range indicator	FOCUS knob	Turn clockwise or counter-clockwise to obtain a clearly defined indicator presentation.		107	A
8	Missile track control drawer	TEST-NORMAL switch	NORMAL	*Note.* The missile tracking radar system is now in an "operate" condition and is ready for an engagement, provided the computer is energized to the operate condition in accordance with table VII.	104	A

110 (U). Energizing Radar Test Set TS-847A/MSW-1

All controls necessary for the remote operation of the radar test set TS-847A/MSW-1 (fig. 53) are on the missile control-indicator (fig. 36) on the missile radar control console, and the target test control (fig. 34) on the target radar control console. To apply primary power to the radar test set, both the MAIN POWER switch (R, fig. 88) on the radar power control panel (fig. 33) and the AC POWER switch (P, fig. 112) on the radar test set must be set to the ON position. The AC POWER switch is normally left in the ON position so that the application of primary power to the radar test set may be controlled with the MAIN POWER switch on the radar power control panel. To energize the radar test set from the trailer mounted tracking station, the procedure given in *a* below should be followed. To energize the radar test set locally the procedure given in *b* below should be followed.

a. Energizing Radar Test Set TS-847A/MSW-1 From the Trailer Mounted Tracking Station.

(1) *Energizing from the target radar control console.* To energize the radar test set from the target radar control console, set the controls in (*a*) through (*e*) below to the positions given.

(*a*) Set MAIN POWER switch (R, fig. 88) on the radar power control panel (fig. 33) to the ON position.

(*b*) Set the AC POWER switch (P, fig. 112) on the radar test set to the ON position.

(*c*) Set the TEST switch (S, fig. 112) on the radar test set to the REMOTE position.

(*d*) Set the TEST-NORMAL switch (J, fig. 96) on the target track control drawer (fig. 34) to the TEST position.

(*e*) Set the TARGET-STANDBY-MISSILE switch (L, fig. 106) on the missile control-indicator group (fig. 36) to the TARGET position.

Note. The radar test set is now energized for operation with the target tracking radar system.

(2) *Energizing from the missile radar control console.* To energize the radar test set from the missile radar control console, set the controls in (*a*) through (*e*) below to the positions given.

(*a*) Set MAIN POWER switch (R, fig. 88) on the radar power control panel (fig. 33) to the ON position.

(*b*) Set the AC POWER switch (P, fig. 112) on the radar test set to the ON position.

(*c*) Set the TEST switch (S, fig. 112) on the radar test set to the REMOTE position.

(*d*) Set the TEST-NORMAL switch (A, fig. 104) on the missile track control drawer (fig. 36) to the TEST position.

(e) Set the TARGET-STANDBY-MISSILE switch (L, fig. 106) on the missile control-indicator group (fig. 36) to the MISSILE position.

Note. The radar test set is now energized for operation with the missile tracking radar system.

b. *Energizing Radar Test Set TS-847A/MSW-1 Locally.* The radar test set has facilities for locally controlling the application of power. If the MAIN POWER switch (R, fig. 88) on the radar power control panel (fig. 33) is set to the ON position, the radar test set is energized when the AC POWER switch (P, fig. 112) on the radar test set is set to the ON position, provided the TEST switch (S, fig. 112) on the radar test set is set to any position other than REMOTE. The radar test set is normally energized locally for calibration check and adjustment. These checks and adjustments are given in TM 9-1430-252-12 and TM 9-1430-252-12/2.

Section II (CMHA). OPERATION OF THE RADAR COURSE DIRECTING CENTRAL UNDER USUAL CONDITIONS

111 (U). General

a. This section describes the procedure for operating the radar course directing central under usual condition during a surface-to-air mission, a surface-to-air low-altitude mission, and a surface-to-surface mission.

b. The necessary daily, weekly, and monthly operational checks contained in TM 9-1430-250-12, TM 9-1430-251-12, TM 9-1430-252-12, and TM 9-1430-252-12/2 shall be performed at the specified intervals. The equipment must be trouble-free, and energized to the "Operate" condition as explained in section I above. Operating personnel must have a thorough knowledge of the material in chapter 5.

112 (CMHA). Surface-to-Air Mission

The majority of the operations performed by the radar course directing central during a normal surface-to-air engagement are automatic; however, the design of the equipment requires that certain operations be manually initiated and controlled. The operations necessary to fire a missile for a surface-to-air engagement are explained in *a* through *h* below.

a. *Detecting the Target.* An approaching target is first observed on the PPI (fig. 24). When target video (B, fig. 113) appears on the PPI, the target should be interrogated.

b. *Interrogating the Target.* The target is interrogated to determine whether it is friendly or hostile. Interrogation is accomplished by means of identification friend or foe (IFF) equipment associated with the acquisition radar system, or by means of fire distribution system equipment, and by use of any other source of information available to the battery control officer. The operations necessary to interrogate a target by means of IFF equipment are discussed in paragraph 86. The operations necessary to interrogate a target by means of the fire distribution system equipment are discussed in paragraphs 84 and 85. If a target is interrogated and identified as hostile, the IFF—FOE switch (U, fig. 82) on the acquisition control-indicator (fig. 24) is depressed.

Note. If a complete record of the engagement is desired, set the equipment status switch (U, 1, fig. 78) to RED immediately after target interrogation. This action energizes the multichannel data recorder (fig. 23) when the DESIGNATE-ABANDON switch (B, fig. 79) is operated to DESIGNATE.

c. *Acquiring the Target With the Acquisition Radar System.* To acquire a target with the acquisition radar system, the azimuth switch (F, fig. 79) on the target designate control-indicator (fig. 24) is held depressed while the azimuth knobs (G and H, fig. 79) are turned to position the steerable azimuth line (fig. 114) to coincide with the azimuth of the target. Simultaneously, the range handwheel (C, fig. 79), on the target designate control-indicator is rotated to position the acquisition range circle (F, fig. 113) to the range of the target video (B, fig. 113). The range SLEW switch (D, fig. 79) may be operated for more rapid positioning of the acquisition range circle. When the steerable azimuth line (fig. 114) and the acquisition range circle are superimposed on the target, the azimuth switch (F, fig. 79) is released. While viewing the display (fig. 115) on the precision indicator (fig. 24), the azimuth knob (fine) (G, fig. 79) and the range handwheel (C, fig. 79) are operated as required to maintain coincidence of the acquisition (flashing) azimuth line (E, fig. 113) and the acquisition range circle (F, fig. 113) with the target video (B, fig. 113).

d. Designating the Target. While the target is being tracked on the precision indicator (fig. 24), the DESIGNATE-ABANDON switch (B, fig. 79) on the target designate control-indicator (fig. 24) is momentarily operated to the DESIGNATE position to transmit target azimuth and range information to the target tracking radar system. In NIKE-HERCULES systems with anti-jam display (AJD) capabilities, the jam strobe (2 or 7, fig. 113.1) may obscure the target. Under this condition, only azimuth information is transmitted to the target tracking radar system. The target radar operator performs the range and elevation search. The strobe technique is used only in an electronic counter-measures (ECM) environment and permits the acquisition operator to rapidly designate all enemy targets in the defended area, even though severe jamming is present.

e. Acquiring the Target With the Target Tracking Radar System. When the buzzer on the target radar control console (fig. 34) sounds, signifying that a target has been designated, the ACQUIRE switch (E, fig. 96) on the target track control drawer (fig. 34) is operated to the left position and held in this position until the target tracking radar system slews to the azimuth and range coordinates of the designated target. When the target tracking radar system is slewed to the proper coordinates, the electronic cross (A, fig. 113) on each PPI (fig. 24 and fig. 34) is superimposed on the intersection of the acquisition range circle (F, fig. 113) and the acquisition (flashing) azimuth line (E, fig. 113). The target then appears on the precision indicator (fig. 34) on the target radar control console. The target is then tracked on the precision indicator by rotating the azimuth handwheel (H, fig. 96) and the range handwheel (P, fig. 96) on the target track control drawer (fig. 34), in either the manual or aided mode of operation as required to keep the electronic cross (G, fig. 115) centered on the target. Simultaneously the elevation handwheel (C, fig. 96) on the target track control drawer is rotated until a target "pip" (fig. 119) appears on the elevation indicator (fig. 34), azimuth indicator, and range indicator. The range handwheel (P, fig. 96) is then rotated until the target "pip" (fig. 121) on the range indicator appears in the center of the 100-yard range notch. The azimuth handwheel and the elevation handwheel are then rotated until the error "pip" (fig. 119) is removed from both the elevation indicator and the azimuth indicator. When the target tracking radar system is tracking the target in azimuth, elevation, and range, the manual, aided, or automatic mode of operation may be used. Operations necessary to track a target in range, azimuth, and elevation in the three modes of operation are given in paragraph 87*a, b,* and *c.* The TRACKED switch (G, fig. 96) on the target track control drawer (fig. 34) is depressed when the target is being tracked in all three coordinates.

f. Selecting the Mission and Missile. The MISSION switch (LL, 1, fig. 77) on the battery signal panel-indicator (fig. 24) is set to the SA position. After information regarding the number of aircraft comprising the target is obtained, the MISSILE switch (GG, 1, fig. 77) on the battery signal panel-indicator is set to the position designating the kind of warhead most appropriate for the particular engagement. The LAUNCHER DATA switch (JJ, 1, fig. 77) on the battery signal panel-indicator is then depressed, making available to the launching area the information corresponding to the setting of the MISSION switch and the MISSILE switch.

g. Operating the Missile Tracking Radar System. During an engagement the operation of the missile tracking radar system is automatic.

(1) The TEST NORMAL switch (A, fig. 104) on the missile track control drawer is set to NORMAL. This action removes the effect of test circuitry and conditions the missile tracking radar system for automatic operation.

(2) The RECEIVED SIGNAL meter (K, fig. 106) on the missile control-indicator group (fig. 36) indicates the strength of the returned signal from the designated missile. This signal should be as great or greater than the value specified by organizational maintenance personnel. The range indicator (fig. 36) is observed to ascertain that a "pip" is centered in the 100-yard range notch (fig. 121). The "pip" indicates that the missile tracking radar system is "locked-on" and tracking the designated missile. The operator should monitor the RECEIVED SIGNAL meter and the range indicator (fig. 36) to obtain information concerning the behavior of the designated missile throughout the engagement.

(3) When the missile tracking radar locks on the designated missile, the TRACK indicator light (E, fig. 106) illuminates. If the TRACK light does not illuminate, the missile tracking radar is not locked on and will not lock on the designated missile; however this condition may be overridden by depressing the TRACKED switch (H, fig. 104). This action provides the necessary indicator light and relay sequence for firing the missile. Should the missile be considered unfit to fire, a new missile must be designated and the REJECT switch (K, fig. 104) depressed. If the beacon of an airborne missile is "lost" and is not acquired by the missile tracking radar within three seconds, the missile tracking radar slews to the next designated missile or to the flight simulator if no missile has been designated.

h. Firing the Missile. When the green READY TO FIRE indicator light (T, 1, fig. 77) on the battery signal panel-indicator (fig. 24) is illuminated, the system is ready to fire. The altitude and horizontal plotting boards display information that aids in determining when the FIRE switch (V, 1, fig. 78) on the tactical control-indicator (fig. 24) should be operated. After the FIRE switch is operated the remainder of the engagement is automatic.

113 (U). Surface-to-Air Low Altitude Mission

When the MISSION switch (LL, 1, fig. 77) on the battery signal panel-indicator (fig. 24) is set to the LA position, the equipment in the radar course directing central is automatically conditioned for a surface-to-air low altitude engagement. The operational sequence is the same as that for a normal surface-to-air engagement, discussed in paragraph 112.

114 (CMHA). Surface-to-Surface Mission

Provisions for the surface-to-surface engagement were incorporated into the NIKE-HERCULES System, to supplement its primary objective, which is to engage and destroy hostile aircraft approaching a defended area.

a. During a surface-to-surface engagement, the operation of the radar course directing central is the same as the operation during the surface-to-air engagement, with the exceptions given in (1) through (5) below.

(1) *Preliminary data.* The information designating the NIKE-HERCULES System for a surface-to-surface engagement comes from higher headquarters. This information consists of the following: mission and warhead; azimuth, elevation, and range setting of the target tracking radar system; and height displacement and FINAL DIVE TIME setting of the computer. Upon receipt of this information, the MISSION switch (LL, 1, fig. 77) on the battery signal panel-indicator (fig. 24) is set to SS and the MISSILE switch (GG, 1, fig. 77) on the battery signal panel-indicator is set to select the warhead ordered for the engagement. After both switches are set, the LAUNCHER DATA switch (JJ, 1, fig. 77) on the battery signal panel-indicator is depressed.

(2) *Acquisition radar system.* Because the target position coordinates are known, the acquisition radar system is not used; however, the IFF-FOE switch (U, fig. 82) on the acquisition control-indicator, and the DESIGNATE-ABANDON switch (B, fig. 79) on the target designate control-indicator are used. The IFF-FOE switch must be depressed, and the DESIGNATE-ABANDON switch must be operated to DESIGNATE before the target-tracked signal can be initiated. Target foe, target designated, and target tracked signals must be initiated during a surface-to-surface engagement. The NIKE-HERCULES System requires that these procedures be performed before a missile can be fired.

(3) *Missile tracking radar system.* The operation of the missile tracking radar system during a surface-to-surface engagement is the same as during a surface-to-air engagement, discussed in paragraph 112*g*, with the exceptions explained in (*a*) and (*b*) below.

(*a*) In a surface-to-surface engagement, a line of sight between the missile track antenna-receiver-transmitter group and the target may not be obtainable due to masking. Therefore the missile tracking radar system could lose control of the missile before it reaches the target. To prevent this loss of control and the resultant detonation of the missile warhead due to the missile fail-safe feature, a guidance cutoff point is manually set into the missile tracking radar system. The elevation of this point is some distance above the point where ground guidance would normally be lost. When the missile reaches this guidance cutoff point, the missile tracking radar system transmits a signal which disables the fail-safe mechanism. This causes the missile to roll 180 degrees, arming a barometric fuse. The missile then follows a substantially vertical ballistic trajectory toward the target until the altitude is reached at which the barometric fuse causes the missile warhead to detonate.

(*b*) The guidance cutoff (GCO) point is preset into the missile tracking radar system. For adjustment of GCO refer to TM 9-1430-251-20.

(4) *Target tracking radar system.* During a surface-to-surface engagement the target tracking radar system is

operated in the manual mode, discussed in paragraph 87. The azimuth, elevation, and range coordinates of the target are obtained from the battery control officer. The elevation and azimuth coordinates are set into the target tracking radar system by means of the local antenna control at the target track antenna-receiver-transmitter group (fig. 49). The elevation and azimuth settings are locked in by setting the ELEV switch (E, fig. 97) and AZ switch (F, fig. 97) on the electric light control (fig. 34) to the COORDINATE LOCK position. The range coordinate is set into the target tracking radar system by means of the range handwheel (P, fig. 96) and the range SLEW switch (K, fig. 96) on the target track control drawer fig. 34). The range setting is locked in by setting the RANGE switch (G, fig. 97) on the electric light control to the COORDINATE LOCK position. When all three coordinates of the target are set and locked in the target tracking radar system, the TRACKED switch (G, fig. 96) on the target track control drawer is depressed. The ACQUIRE switch (E, fig. 96) on the target track control drawer is not operated as in a surface-to-air engagement since target confirmed is automatic during a surface-to-surface engagement. The target tracking radar system continues to operate in the manual mode, and remains set to the manually set-in coordinates throughout the engagement.

(5) *Computer system.* When the MISSION switch (LL, 1, fig. 77) on the battery signal panel-indicator (fig. 24) is set to the SS position, the computer system is automatically conditioned for a surface-to-surface engagement. However, the correct value of height displacement and final dive time must be manually set into the computer system. Height displacement is the distance above the target of the displaced aiming point. The correct value of height displacement is obtained from the recorder sheet and is set into the computer system by adjusting the HT DISPLACE knob (G, fig. 86) in the upper compartment of the servo computer assembly (fig. 28). Final dive time is the time before the missile reaches the displaced aiming point that the final dive orders are issued. The correct value of final dive time is also obtained from the recorder sheet and is set into the computer system by adjusting the FINAL DIVE TIME knob (E, fig. 86) in the upper compartment of the servo computer assembly (fig. 28) and is indicated on the FINAL DIVE TIME dial (F, fig. 86).

b. After the operations discussed in *a* above have been performed, and the READY TO FIRE indicator light (T, 1, fig. 77) on the battery signal panel-indicator (fig. 24) illuminates, the system is ready to fire. After the FIRE switch (V, 1, fig. 78) on the tactical control-indicator (fig. 24) is operated, the remainder of the engagement is automatic.

Section III (U). OPERATION OF THE RADAR COURSE DIRECTING CENTRAL UNDER UNUSUAL CLIMATIC CONDITIONS

Note. **The operation of the radar and computing equipment may be difficult in regions where extreme cold, extreme heat, humidity and moisture, sand conditions, or high winds prevail. Procedures for minimizing the effects of these unusual climatic conditions are discussed in paragraphs 115 through 119.**

115 (U). Operation in Extreme Cold

Subzero temperatures and climatic conditions associated with cold weather affect the operation of the equipment. Instructions and precautions for operations under such adverse conditions are given in *a* through *d* below.

a. Use the personnel heaters to keep the equipment as warm and dry as possible.

b. Keep the equipment energized to "Low Voltage" to maintain the minimum exhaust temperature in accordance with standing operation procedures (SOP's).

c. Cover all exterior openings which are not in use to help prevent excessive heat loss.

d. Place rubber-covered cables carefully and, if possible, do not bend or move them. If the cables must be bent or moved, warm them beforehand.

116 (U). Operation in Extreme Heat

When operating the equipment in continued high temperatures, it is essential that the ventilating systems function properly. Instructions for proper care are given in *a* and *b* below.

a. Personnel Ventilation. Inspect the blower in the personnel heater cabinet for proper operation. Check the air port and duct for free passage of air. Test the blower intake and discharge dampers for ease of operation.

b. Equipment Cooling. Check the operation of the equipment cooling fan in the equipment cooling cabinet assembly (fig. 18). Make certain that the intake filter is clean. Test the operation of the shutter and damper control.

117 (U). Operation Under Extreme Dust Conditions

Operation of the equipment under extreme dust and sand conditions necessitates special care, since dust and sand form an abrasive mixture that causes rapid wear of equipment, often rendering it inoperative. Instructions and precautions for operation under such adverse conditions are listed in *a* through *c* below.

a. Inspect the ventilating filters frequently, and clean or replace, as necessary, to insure proper functioning of the ventilating systems.

b. Use protective covers whenever practical.

c. Pay particular attention to the lubrication of the equipment. Excessive amounts of dust or sand that come in contact with oil and grease result in grit which damages the equipment.

118 (U). Operation in Areas of High Humidity

Operation under conditions of high humidity presents problems of oxidation and corrosion, condensation, mildew, and fungus growth. During operation, sufficient heat is normally developed, and proper ventilation is maintained, to eliminate the problems associated with the high humidity. However, during nonoperational periods, high humidity may cause problems which render the equipment inoperative. These problems are reduced by following the procedures given in *a* through *c* below.

a. Operate the personnel heaters continuously and keep the trailer doors closed.

***Caution:* Avoid overheating the equipment since excessive temperatures may damage it.**

b. Check that all cable fittings are tight to prevent moisture from entering the connectors. A cable end should never be left exposed without tightly securing its cap in place.

c. Periodically inspect the equipment for chipped or cracked paint and corrosion. Unpainted surfaces and worn spots should be painted with the proper rust preventative, moisture-proofing compound, and fungus proofing compound.

119 (U). Operation During High Winds

High winds are usually accompanied by either dust, sand, rain, or snow. The procedures given in paragraphs 117 and 118 are to be followed where applicable. In addition, the procedures given in *a* through *c* below should be followed.

a. Tie down the acquisition antenna-receiver-transmitter group (fig. 39), the target track antenna-receiver-transmitter group (fig. 49), and the missile track antenna-receiver-transmitter group.

b. Inflate the track antenna radomes (fig. 49) of the missile and target track antenna-receiver-transmitter groups.

c. Emplace additional sandbags in accordance with standing operating procedures (SOP's).

Section IV (U). OPERATION DURING LOSS OF INTERAREA CABLES

120 (U). General

When the interarea cables between the launching area and the radar course directing central are severed or damaged, gyro preset information (A_G), missile designation information, and the fire command must be transmitted manually. The operation of the acquisition radar system, computer system, and the target tracking radar system is the same as the operation under usual conditions, discussed in paragraphs 112, 113, and 114. Certain controls on the battery control console and the missile radar control console are operated differently. The operational sequence of these controls is given in paragraph 121.

121 (U). Emergency Procedures During Loss of Interarea Cables

a. The LOCAL DESIGNATE switch (J, fig. 103) on the missile track indicator (fig. 36) of the missile radar control console is placed in the up position.

b. Information as to the launcher and section that contain the designated missile is obtained from the launching area by voice communications.

c. The SECTION switch (U, V, W, or X, fig. 103) and the LAUNCHER switch (N, P, Q, or R, fig. 103) on the missile track indicator (fig. 36) that correspond with the section and launcher of the missile designated by the launching area are depressed.

d. The LAUNCHER ACQUIRE switch (C, fig. 104) on the missile track control drawer (fig. 36) is operated to slew the missile tracking radar system to the designated missile.

e. The MISSILE READY switch (H, fig. 103) should be set to the up position when the launching area indicates that the missile is ready. For the remainder of the engagement, the missile tracking radar system operates normally as given in paragraph 112.

f. Upon receipt of the information that a missile has been designated, the GYRO AZIMUTH servo dial (D, fig. 85) on the servo computer assembly (fig. 28) should be observed, and the gyro azimuth presetting information should be transmitted by voice communication to the launching area. Observation of the GYRO AZIMUTH servo dial should be continued, and the information transmitted, every 10 seconds, or for every 50-mil change until the fire command is issued.

g. The launching area should stand by for the fire command which is transmitted to the launching area from the radar course directing central by means of voice communications. The battery signal panel-indicator (fig. 24) on the battery-control console should be observed to determine when the system is capable of firing a missile. The FIRE switch (V, 1, fig. 78) on the tactical control-indicator (fig. 24) should be operated at the selected time. Simultaneously the fire command must be issued in the launching area to the designated missile.

Section V (CMHA). DEENERGIZING THE EQUIPMENT

122 (U). Deenergizing the Missile Tracking Radar System

a. "Operate" to "Low Voltage". To transfer the missile tracking radar system from the "operate" to the "low voltage" condition, perform the steps in table XVII in the sequence given.

Table XVII (U). Deenergizing—"Operate" to "Low Voltage"—Missile Tracking Radar System

Step	Location	Control	Control setting	Remarks	Reference: Figure	Reference: Key
	Trailer mounted tracking station					
	Missile radar control console				B, 31, and 36	
1	Missile track indicator	LOCAL DESIGNATE switch	Off (down)		103	J
2	Missile track indicator	MISSILE READY switch	Off (down)		103	H
3	Range indicator	IMAGE SPACING switch	OFF		107	E
4	Range indicator	INTENSITY knob	Fully counterclockwise		107	B
5	Range indicator	SWEEP LENGTH knob	Fully counterclockwise		107	C
6	Missile control-indicator group	TARGET-STANDBY-MISSILE switch	STANDBY		106 104	L A
7	Missile track control drawer	TEST-NORMAL switch	TEST		104	A
8	Missile track control drawer	DISABLE switch	Off (down)		104	M
9	Missile track control drawer	SERVOS switch	Off (center)		104	P
10	Missile track control drawer	RANGE switch	NORMAL		104	D
11	Missile track control power supply	HV SUPPLY knob	START (fully counterclockwise)		105	M
12	Missile track control power supply	HV SUPPLY-OFF switch	Depress.	*a.* The HV SUPPLY-ON indicator light (J, fig. 105) on the missile track control power supply and the MISSILE - HIGH VOLTS - ON indicator light (G, fig. 88) on the radar power control panel (fig. 33) extinguish.	105	K

Table XVII. Deenergizing—"Operate" to "Low Voltage"—Missile-Tracking Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
				b. The MISSILE - HIGH VOLTS - PREHEAT indicator light (K, fig. 88), MISSILE-HIGH VOLTS-HOT indicator light (J, fig. 88), MISSILE-HIGH VOLTS-READY indicator light (H, fig. 88), MISSILE-INTLK indicator light (P, fig. 88) on the radar power control panel (fig. 33), and HV SUPPLY - READY indicator light (L, fig. 105) on the missile track control power supply (fig. 36) illuminate.		
13	Missile track control power supply.	IND HV switch	OFF	The IND HV indicator light (F, fig. 105) extinguishes.	105	G
14	Missile track control power supply.	AGC-MANUAL switch.	AGC		105	D

b. "Low Voltage" to "Shutdown". To transfer the missile-tracking radar system from the "low voltage" condition to the "shutdown" condition, perform the steps in table XVIII in the sequence given.

Table XVIII. Deenergizing—"Low Voltage" to "Shutdown"—Missile-Tracking Radar System

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
	Trailer-mounted tracking station.				A, 31,	
	Radar power supply group.				and 33	
1	Radar power control panel.	MISSILE-PLATE VOLTS switch.	OFF	*a.* Remove plate voltage from the missile-tracking radar system. *b.* MISSILE-PLATE VOLTS-READY indicator light (N, fig. 88) illuminates.	88	M

Table XVIII. Deenergizing—"Low Voltage" to "Shutdown"—Missile-Tracking Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Fig.	Reference Key
				c. MISSILE-PLATE VOLTS-ON indicator light (L, fig. 88) MISSILE-HIGH VOLTS-READY indicator light (H, fig. 88) on the radar power control panel (fig. 33) and HV SUPPLY-READY indicator light (L, fig. 105) on the missile track control power supply (fig. 36) extinguish.		
2	Radar power control panel.	MISSILE POWER switch.	Off (down)	MISSILE-HIGH VOLTS-PREHEAT indicator light (K, fig. 88), MISSILE-PLATE VOLTS-READY indicator light (N, fig. 88), and MISSILE-HIGH VOLTS-HOT indicator light (J, fig. 88) extinguish. MISSILE-INTLK, indicator light (P, fig. 88) remains illuminated.	88	Q
3	Radar power control panel.	MAIN POWER switch.	Off (down) *Note.* This switch should be left in the on (up) position if target-tracking radar system is energized and is to remain energized.	Removes all power to the radar equipment in the trailer-mounted tracking station. ***Warning:* Make certain that the trailer-mounted tracking station power generator is turned off before disconnecting any external power cables. Voltages DANGEROUS TO LIFE are present in these cables when the generator is operating.**	88	R

123 (U). Deenergizing Target Tracking Radar System

a. "Operate" to "Low Voltage". To transfer the target tracking radar system from the "operate" to "low voltage" condition, perform the steps in table XIX in the sequence given.

Table XIX (U). Deenergizing—"Operate" to "Low Voltage"—Target Tracking Radar System

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
	Trailer mounted tracking station					
	Target radar control console				A, 31 and 34	
1	Elevation indicator	IMAGE SPACING switch	NOR		98	E
2	Elevation indicator	INTENSITY knob	Fully counterclockwise		98	B
3	Elevation indicator	SWEEP LENGTH knob	Fully counterclockwise		98	C
4	Azimuth indicator	IMAGE SPACING switch	NOR		98	E
5	Azimuth indicator	INTENSITY knob	Fully counterclockwise		98	B
6	Azimuth indicator	SWEEP LENGTH knob	Fully counterclockwise		98	C
7	Range indicator	IMAGE SPACING switch	OFF		98	E
8	Range indicator	INTENSITY knob	Fully counterclockwise		98	B
9	Range indicator	SWEEP LENGTH knob	Fully counterclockwise		98	C
10	PPI	INTENSITY knob	Fully counterclockwise		100	B
11	PPI	GAIN knob	Fully counterclockwise		100	C
12	Precision indicator	INTENSITY knob	Fully counterclockwise		94	A
13	Precision indicator	GAIN knob	Fully counterclockwise		94	B
14	Target track control drawer	Azimuth MAN-AID-AUTO switch	MAN		96	D
15	(Deleted)					
16	Target track control drawer	SERVOS switch	Off (center)		96	R
17	Target track control drawer	TEST-NORMAL switch	NORMAL		96	J

Table XIX (U). Deenergizing—"Operate" to "Low Voltage"—Target Tracking Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
18	Target track control drawer	Range MAN-AID-AUTO switch	MAN		96	L
19	Target track control drawer	RANGE switch	NORMAL		96	M
20	Target track control drawer	Elevation MAN-AID-AUTO switch	MAN		96	A
21	Target track control power supply	HV SUPPLY knob	START (fully counterclockwise)		99	M
22	Target track control power supply	HV SUPPLY-OFF switch	Depress	*a.* The HV SUPPLY-ON indicator light (J, fig. 99) on the target track control power supply and the TARGET-HIGH VOLTS-ON indicator light (T, fig. 88) on the radar power control panel (fig. 33) extinguish. *b.* The TARGET-HIGH VOLTS-PREHEAT indicator light (W, fig. 88), TARGET-HIGH VOLTS-HOT indicator light (V, fig. 88), TARGET-HIGH VOLTS-READY indicator light (U, fig. 88), and TARGET-INTLK indicator light (AA, fig. 88) on the radar power control panel (fig. 33) and HV SUPPLY-READY indicator light (L, fig. 99) on the target track control power supply (fig. 34) illuminate.	99	K
23	Target track control power supply	AGC-MANUAL switch	AGC		99	D
24	Target track control power supply	IND HV switch	OFF	The IND-HV indicator light (F, fig. 99) extinguishes.	99	G

b. "Low Voltage" to "Shutdown". To transfer the target tracking radar system from the "low voltage" to "shutdown" condition, perform the steps in table XX in the sequence given.

Table XX (U). Deenergizing—"Low Voltage" to "Shutdown"—Target Tracking Radar System

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
	Trailer mounted tracking station Radar power supply group				A, 31 and 33	
1	Radar power control panel	TARGET-PLATE VOLTS switch	OFF	*a.* TARGET-PLATE VOLTS-READY indicator light (Z, fig. 88) illuminates. *b.* TARGET-PLATE VOLTS-ON indicator light (X, fig. 88), TARGET-HIGH VOLTS-READY indicator light (U, fig. 88) on the radar power control panel, and HV SUPPLY-READY indicator light (L, fig. 99) on the target track control power supply (fig. 34) extinguish.	88	Y
2	Radar power control panel	TARGET POWER switch	Off (down)	TARGET-HIGH, VOLTS-PREHEAT indicator light (W, fig. 88), TARGET-PLATE VOLTS-READY indicator light (Z, fig. 88), and TARGET-HIGH VOLTS-HOT indicator light (V, fig. 88) extinguish. TARGET-INTLK indicator light (AA, fig. 88) remains illuminated.	88	S
3	Radar power control panel	MAIN POWER switch	Off (down) *Note.* This switch should be left in the ON position if the missile tracking radar system is energized and is to remain energized.	Removes all power to the radar equipment in the trailer mounted tracking station. *Warning:* Voltages DANGEROUS TO LIFE are present when the main power source is energized. Deenergize main power source before disconnecting external power cables.	88	R

124 (U). Deenergizing the Multichannel Data Recorder

The multichannel data recorder (fig. 23) is deenergized by one of three methods as described in *a* through *c* below, depending upon the method used in energizing the recorder.

a. Deenergizing Procedure When the Multichannel Data Recorder Has Been Energized by the Signal-Recording Method. The multichannel data recorder automatically ceases operation when the equipment status switch (U, 1, fig. 78) on the tactical control-indicator (fig. 24) is set to any position other than RED, or if a target has not been designated, or the designated target is abandoned. When the MAIN POWER switch (GG, fig. 70) is set to the off (down) position the multichannel data recorder is completely deenergized.

Note. Do not turn off main power if the target tracking, missile tracking, or acquisition radar systems or computer system is energized and is to remain energized.

b. Deenergizing Procedure When the Multichannel Data Recorder Has Been Energized by the Alternate Signal-Recording Method. The multichannel data recorder (fig. 23) is deenergized when the OPERATE-TEST switch (N, fig. 72) on the multichannel data recorder is set to OPERATE provided the equipment status switch (U, 1, fig. 78) on the tactical control-indicator (fig. 24) is set to any position other than RED, if a target has not been designated or the designated target is abandoned. When the MAIN POWER switch (GG, fig. 70) on the acquisition power control panel (fig. 19) is set to the off (down) position, the multichannel data recorder is completely deenergized.

Note. Do not turn off main power if the target tracking, missile tracking, or acquisition radar systems or computer system is energized and is to remain energized.

c. Deenergizing Procedure When the Multichannel Data Recorder Has Been Energized by the Test Method.

(1) To deenergize the multichannel data recorder, perform the procedures in (*a*) through (*c*) below in the sequence given.

(*a*) Turn shutter knob (M, fig. 72) fully clockwise.

(*b*) Set RECORD-VIEW switch (K, fig. 72) to RECORD.

(*c*) Set OPERATE-TEST switch (N, fig. 72) to OPERATE.

(2) To completely deenergize the multichannel data recorder, set the MAIN POWER switch (GG, fig. 70) to the off (down) position.

125 (U). Deenergizing the Computer System

a. "Operate" to "Computer Standby". To place the computer system in the "computer standby" condition, perform steps (1) and (2) below in the sequence given.

(1) Set the plotting board condition switch (G, 2, fig. 78) on the tactical control-indicator (fig. 24) to STANDBY.

(2) Set COMPUTER CONDITION switch (PP, fig. 84) on the computer control-panel (fig. 28) to STANDBY.

b. "Computer Standby" to "Shutdown". To place the computer system in the "shutdown" condition, perform steps (1) through (4) below in the sequence given.

(1) Set SERVO DC switch (V, fig. 83) on the computer power control panel (fig. 27) to the off (down) position.

(2) Set PLATE VOLTS switch (X, fig. 83) on the computer power control panel (fig. 27) to the off (down) position.

(3) Set COMPUTER POWER switch (Z, fig. 83) on the computer power control panel to OFF.

Note. Do not turn off main power if the target tracking, missile tracking, or acquisition radar systems, or the multichannel data recorder is energized and is to remain energized.

(4) Set the MAIN POWER switch (GG, fig. 70) on the acquisition power control panel (fig. 19) to the off (down) position.

Warning: **Voltages DANGEROUS TO LIFE are present when the main power source is energized. Deenergize before disconnecting external cables.**

126 (U). Deenergizing the Acquisition Radar System

a. "Operate" to "Low Voltage". To transfer the acquisition radar system from the "operate" to "low voltage" condition, perform the steps in table XXI in the sequence given.

Table XXI (CMHA). Deenergizing—"Operate" to "Low Voltage"—Acquisition Radar System

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
	Trailer mounted director station					
	Battery control console				A, 16 and 24	
1	PPI	EXPANSION switch	OFF		80	E
2	PPI	SYMBOLS switch	OFF		80	F
3	PPI	RANGE switch	250,000		80	G
4	PPI	GAIN knob	Fully counterclockwise		80	C
5	PPI	INTENSITY knob	Fully counterclockwise		80	B
5.1	PPI	SYMBOL INTENSITY knob	Fully counterclockwise		80	J
6	Precision indicator	GAIN knob	Fully counterclockwise		81	B
7	Precision indicator	INTENSITY knob	Fully counterclockwise		81	A
8	Acquisition control-indicator	MAGNETRON HV knob	START (fully counterclockwise)		82	QQ
9	Acquisition control-indicator	MAGNETRON-OFF switch	Depress	*a.* The MAGNETRON-ON indicator light (MM, fig. 82) extinguishes and the MAGNETRON-READY indicator light (PP, fig. 82) illuminates.	82	NN

Table XXI (CMHA). Deenergizing—"Operate" to "Low Voltage"—Acquisition Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
9				*b.* Removes high voltage from the acquisition transmitter system. *c.* The HIGH VOLTS-ON indicator light (Y, fig. 70) on the acquisition power control panel (fig. 19) extinguishes, and the following indicator lights on the acquisition power control panel illuminate. (1) HIGH VOLTS-PREHEAT indicator light (BB, fig. 70). (2) HIGH VOLTS-HOT indicator light (AA, fig. 70). (3) HIGH VOLTS-READY indicator light (Z, fig. 70). (4) INTLK indicator light (LL, fig. 70).		
10	Acquisition control-indicator	IND HV switch	OFF	The IND HV-ON indicator light (KK, fig. 82) extinguishes.	82	JJ
11	Acquisition control-indicator	ANTENNA-AZIMUTH RPM switch	OFF		82	M
12	Acquisition control-indicator	ANTENNA-ELEVATION scan switch	Off (center)		82	P

b. "Low Voltage" to "Shutdown". To transfer the acquisition radar system from the "low voltage" to "shutdown" condition, perform the steps in table XXII in the sequence given.

Table XXII (U). Deenergizing—"Low Voltage" to "Shutdown"—Acquisition Radar System

Step	Location	Control	Control setting	Remarks	Reference	
					Figure	Key
	Trailer mounted director station					
	Director station group				A, 16 and 19	
1	Acquisition power control panel	PLATE VOLTS switch	OFF	*a.* Removes plate voltage from the acquisition radar system.	70	J

Table XXII (U). Deenergizing—"Low Voltage" to "Shutdown"—Acquisition Radar System—Continued

Step	Location	Control	Control setting	Remarks	Reference Figure	Reference Key
				b. PLATE VOLTS-ON indicator light (HH, fig. 70) on the acquisition power control panel and AFC-HUNT indicator light (D, fig. 82) on the acquisition control-indicator (fig. 24) extinguish. *c.* PLATE VOLTS-READY indicator light (KK, fig. 70) illuminates. *d.* HIGH VOLTS-READY indicator light (Z, fig. 70) on the acquisition power control panel and MAGNETRON-READY indicator light (PP, fig. 82) on the acquisition control-indicator (fig. 24) extinguish.		
2	Acquisition power control panel	TRACK TRANSMITTER FILAMENTS switch	Off (down)		70	V
3	Acquisition power control panel	ACQUISITION POWER switch	Off (down)		70	DD
4	Acquisition power control panel	MAIN POWER switch	Off (down) *Note.* This switch should be left in the on (up) position if the computer system or either tracking radar system is emergized and is to remain energized.	*Warning:* **Voltages DANGEROUS TO LIFE are present when the main power source is energized. Deenergize main power source before disconnecting external power cables.**	70	GG

CHAPTER 7 (CMHA)

OPERATOR'S MAINTENANCE

Section I (U). OPERATOR'S TOOLS, EQUIPMENT, AND REPAIR PARTS

Reference publications for the tools, equipment, and repair parts issued to the using organization are listed in appendix II. Basic issue items for first echelon maintenance are listed in appendix III.

Section II (U). OPERATOR'S SERVICE INFORMATION

Note. All procedures given in this section are to be performed with the equipment in a power-off condition.

127. (U). Plotting Board Service Information

a. Recorder Pen Installation Procedure.

Note. When not in use, or during travel, the recorder pens are stored in the recorder pen holder (fig. 132) secured behind the altitude plotting board (fig. 24) in the battery control console. The altitude plotting board and the horizontal plotting board each require one left (L) and one right (R) recorder pen.

(1) Pull out altitude plotting board release handle (fig. 24) and swing open altitude plotting board. Remove four recorder pens (fig. 132) from recorder pen holder and close altitude plotting board.

(2) Install one recorder pen stamped R on the right recorder pen arm of each plotting board as prescribed in (*a*) and (*b*) below.

(*a*) Press window release pushbuttons (C, fig. 74, and F, fig. 75) and open window panel of each plotting board.

(*b*) Press pressure plate (fig. 133) against pen carrier and slide pivots on recorder pen into slots on pen carrier.

(3) Install one recorder pen stamped L on the left recorder pen arm of each plotting board as prescribed in (2) above.

(4) Fill pens with ink as prescribed in *c* below.

b. Recorder Pen Removal and Cleaning Procedure.

(1) Press window release pushbuttons (C, fig. 74, and F, fig. 75) and open window panels of each plotting board. Press pressure plate (fig. 133) against pen carrier and slide recorder pen pivots out of slots of pen carrier.

(2) Remove knurled cap from recorder pen and pour out ink.

(3) Insert one strand of cleaning brush 7606025 through tubing and move back and forth several times to clean recorder pen. Soak recorder pen in clear water or alcohol to dissolve any clogged ink.

(4) Store recorder pen, when not in use, in recorder pen holder (fig. 132).

c. Filling Recorder Pens With Ink.

(1) Remove knurled cap (fig. 133) on ink reservoir of the recorder pen. Fill reservoir with green plotting board ink 7601175, using battery filler syringe 7601751. Replace knurled cap.

(2) Start flow of ink in the tubing of recorder pen, when necessary, by using pen filler 7601752. To start flow of ink, press bulb (fig. 134) on pen filler, insert end of tubing into small hole near end of pen filler, and release bulb to draw ink through tubing.

d. Replacing Plotting Board Recording Paper.

(1) Pull on knobs (fig. 135) to open paper access slot cover. Pull out and discard remaining recording paper. Pull out altitude or horizontal plotting board release handle (fig. 24) and open hinged plotting board.

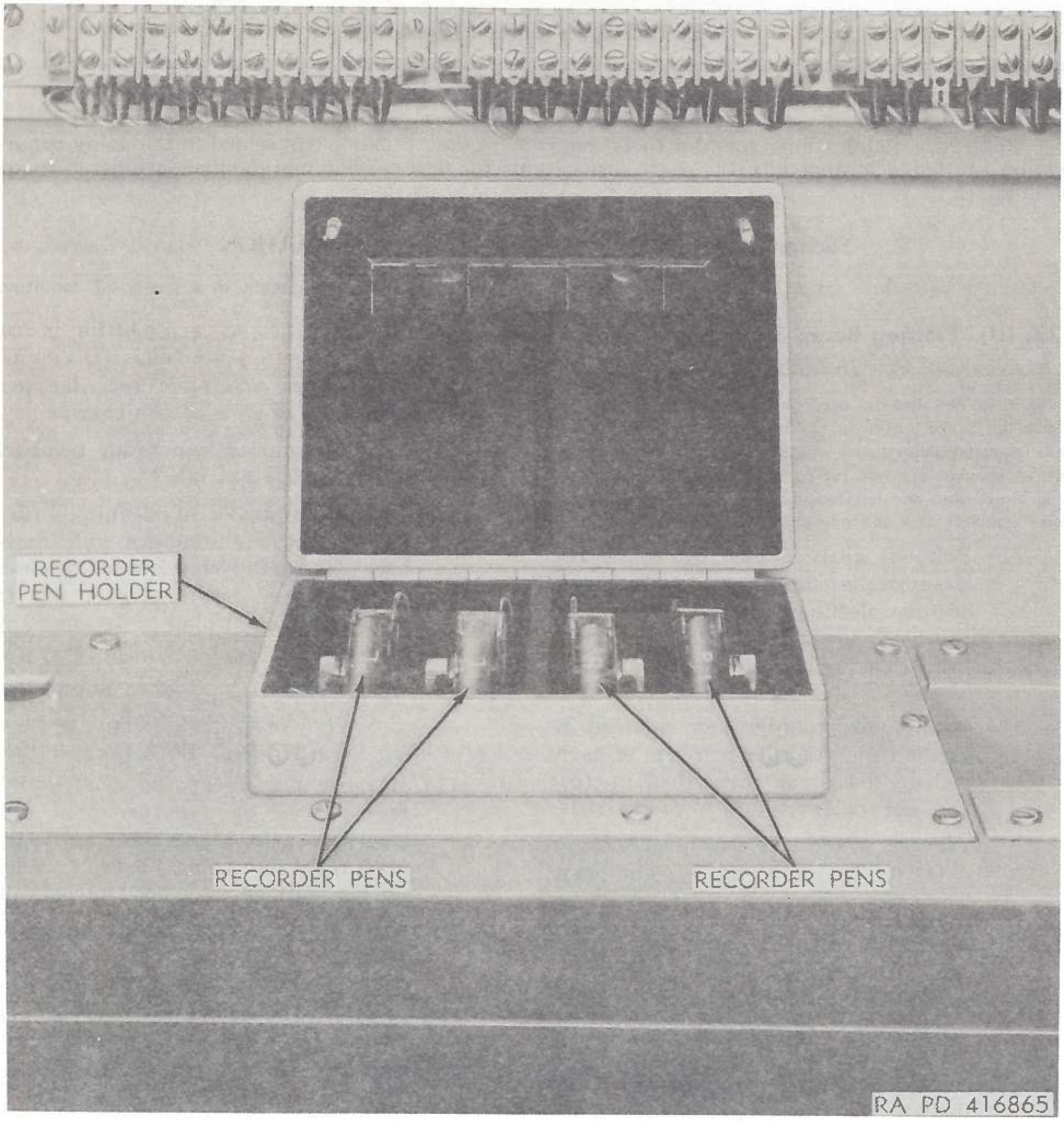

Figure 132 (U). Battery-control console—partial internal view.

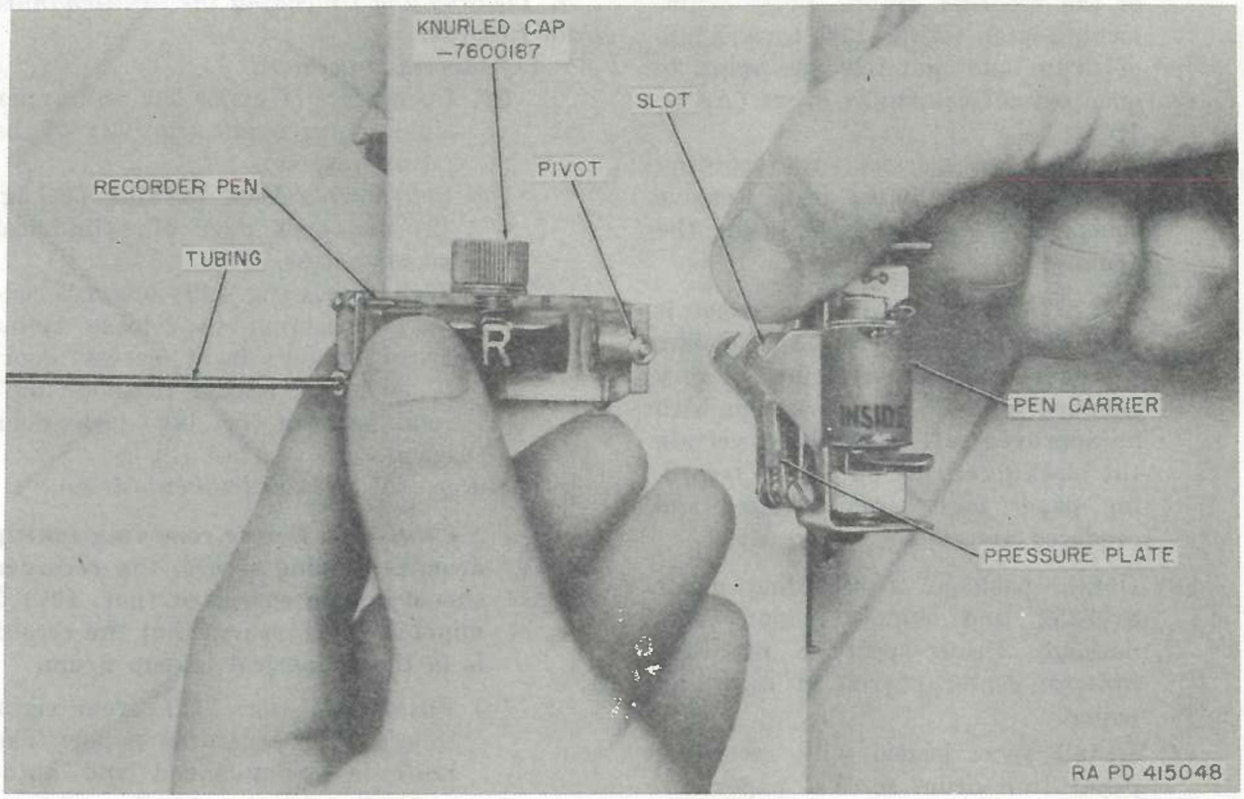

Figure 133 (U). Installing or removing recorder pen.

(2) Loosen lock (fig. 136) and swing down roller support. Remove and discard cardboard cylinder.

(3) Obtain roll of recording paper 8008687 for altitude plotting board, or 7606013 for horizontal plotting board.

(4) Slip end of roll onto roller holder so that roll of recording paper unwinds in a counterclockwise direction as viewed from the top. Position roll vertically and swing roller support into lower end of roll. Secure roller support in place with lock.

(5) Release locknut and loosen roller knob if new roll of recording paper is too long to fit into position. After roller support is fastened in place, tighten roller knob to provide slight drag as roll of recording paper is unwound. Tighten locknut.

(6) Unroll recording paper and carefully thread paper across front of plotting surface.

Note. Fold one corner of paper to a point to facilitate threading.

(7) Push thumbscrew (fig. 137) to right to release roller shafts. Insert end of recording paper between roller shafts and through paper access slot (fig. 135). Press thumbscrew (fig. 137) down and to the left to lock roller shafts against recording paper. Pull recording paper through paper access slot (fig. 135) until folded portion extends six inches outside slot.

(8) Close plotting board and make certain it is latched. Close paper access slot cover over free end of recording paper. Tear off excess paper.

128 (U). Multichannel Data Recorder Service Information

a. Loading Recording Paper Into the Cylindrical Supply Drum.

(1) Obtain cylindrical supply drum (fig. 23) from the upper left compartment

of the recorder group. Press drum-locking latch (C, fig. 138) toward hub of drum and pull felt lips apart to open cylindrical supply drum (A, fig. 138).

(2) Remove and discard any recording paper remaining in the drum. Remove spool (A, fig. 138) from inside the drum.

Caution: **The recording paper is light sensitive; therefore, the loading procedure must be performed in very subdued light or in a darkroom with an approved safe light. Make certain the black lights are off, or the recording paper may become fogged and rendered unusable.**

(3) Obtain package of recording paper 8175352 and remove paper from package. Insert spool (B, fig. 138) through center of roll of recording paper.

(4) Install spool loaded with recording paper into drum so that paper unrolls forward from top of drum when drum is viewed with drum-locking latch (B, fig. 138) on right. This insures that emulsion on recording paper is in proper position when loaded drum is placed in multichannel data recorder.

(5) Pull approximately 6 inches of recording paper (C, fig. 138) out of drum. Rotate inner shell until felt lips are closed. To insure a light-tight seal, make certain felt lips are securely closed and drum-locking latch is locked.

b. Loading and Unloading the Multichannel Data Recorder.

(1) *Access procedure.*

(*a*) Open doors of upper left and upper right compartment (fig. 22) of the recorder group.

(*b*) Pull down release buttons (P, fig. 72) and open door of cylindrical takeup access.

(*c*) Push latches (fig. 139) towards center of recorder to release cylindrical supply drum access door. When latches release, lift door until retaining arm (fig. 140) locks door open.

(2) *Removal of loaded takeup drum.*

Caution: **Before removing takeup drum containing record, the recorder should remain energized (par. 107) 5 minutes. This insures that the record is in the cylindrical takeup drum.**

(*a*) Push knife (fig. 141) from right to left to cut recording paper. The knife is spring-loaded and automatically returns to its original position when released.

(*b*) Place finger in notch (fig. 142) on each end of takeup drum and pull drum out of recorder.

(*c*) Wrap recording paper around take-up drum.

Caution: **Do not open cylindrical takeup drum because exposure to light destroys any record on recording paper.**

(*d*) Forward takeup drum for photographic processing of record.

(3) *Removal of cylindrical supply drum.*

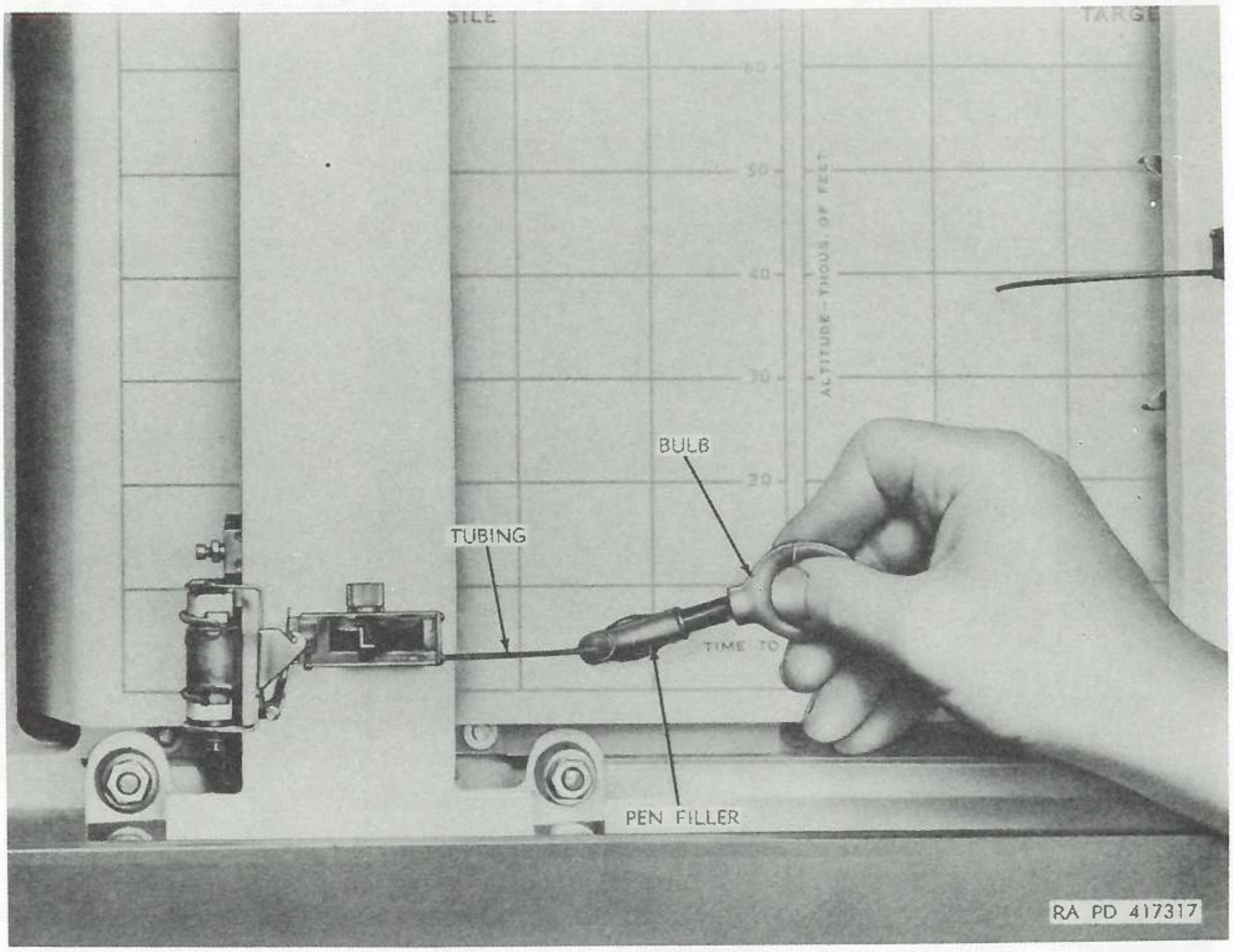

Figure 134. Using pen filler.

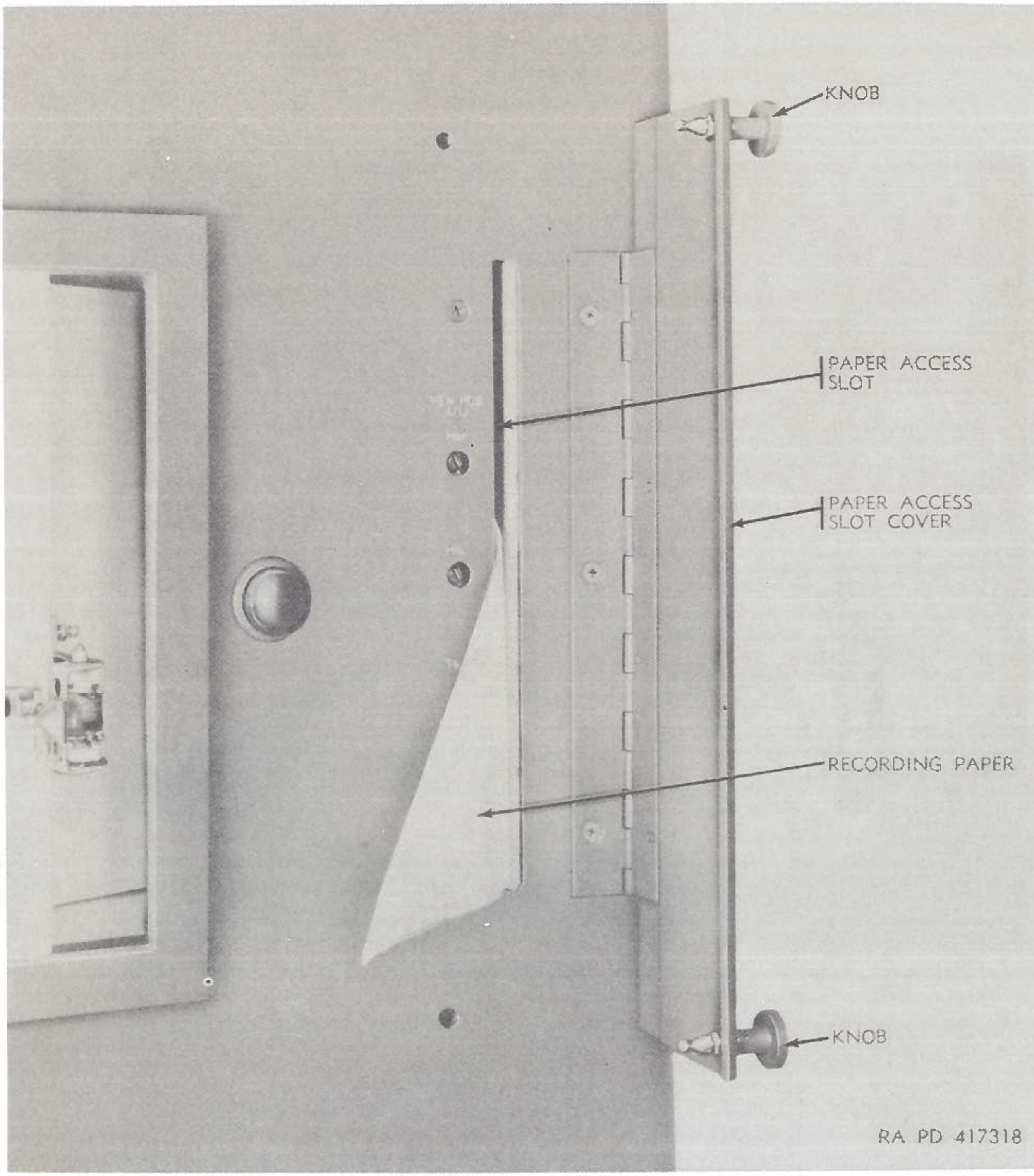

Figure 135. Recording paper extending through paper access slot.

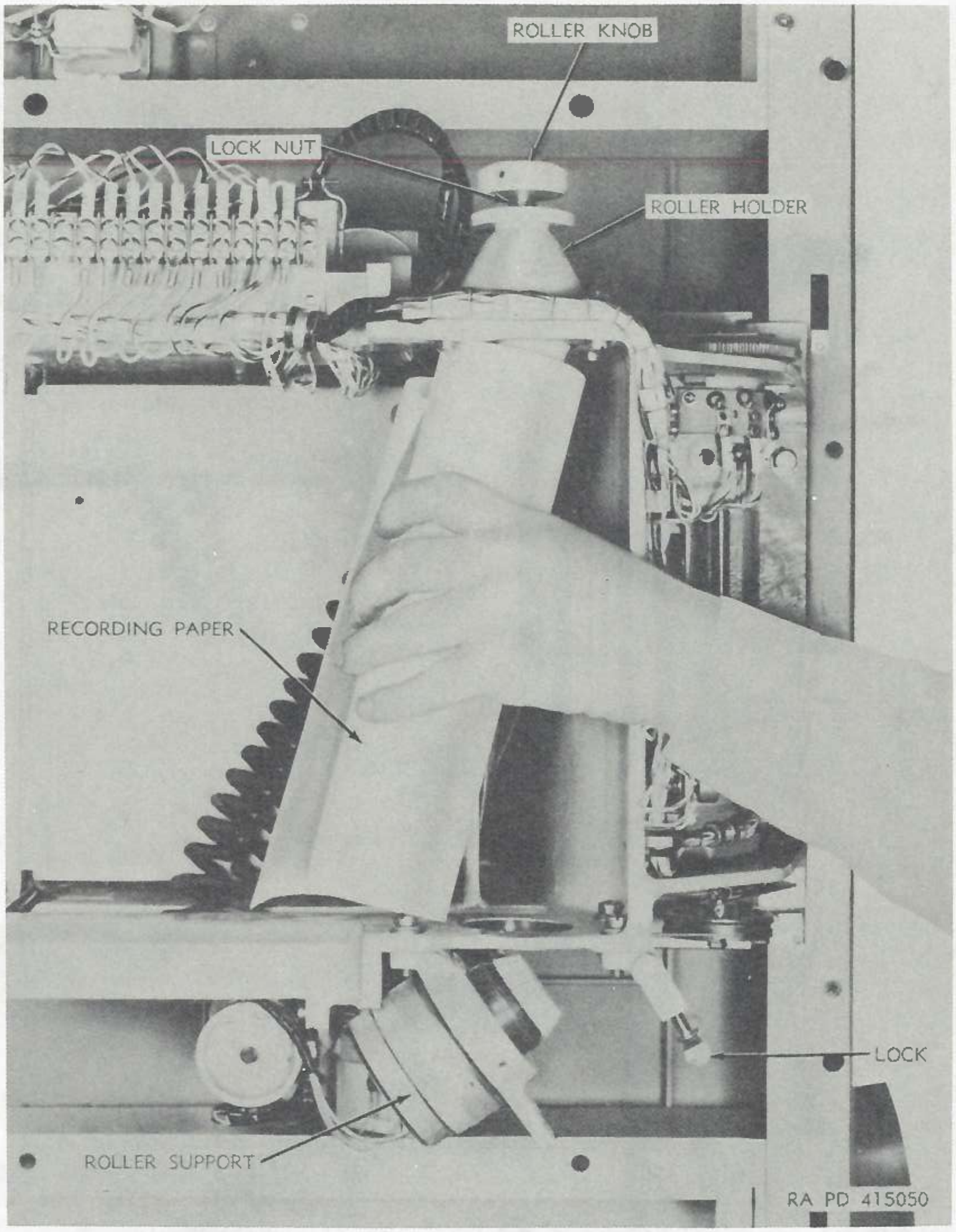

Figure 136. Installing or removing recording paper.

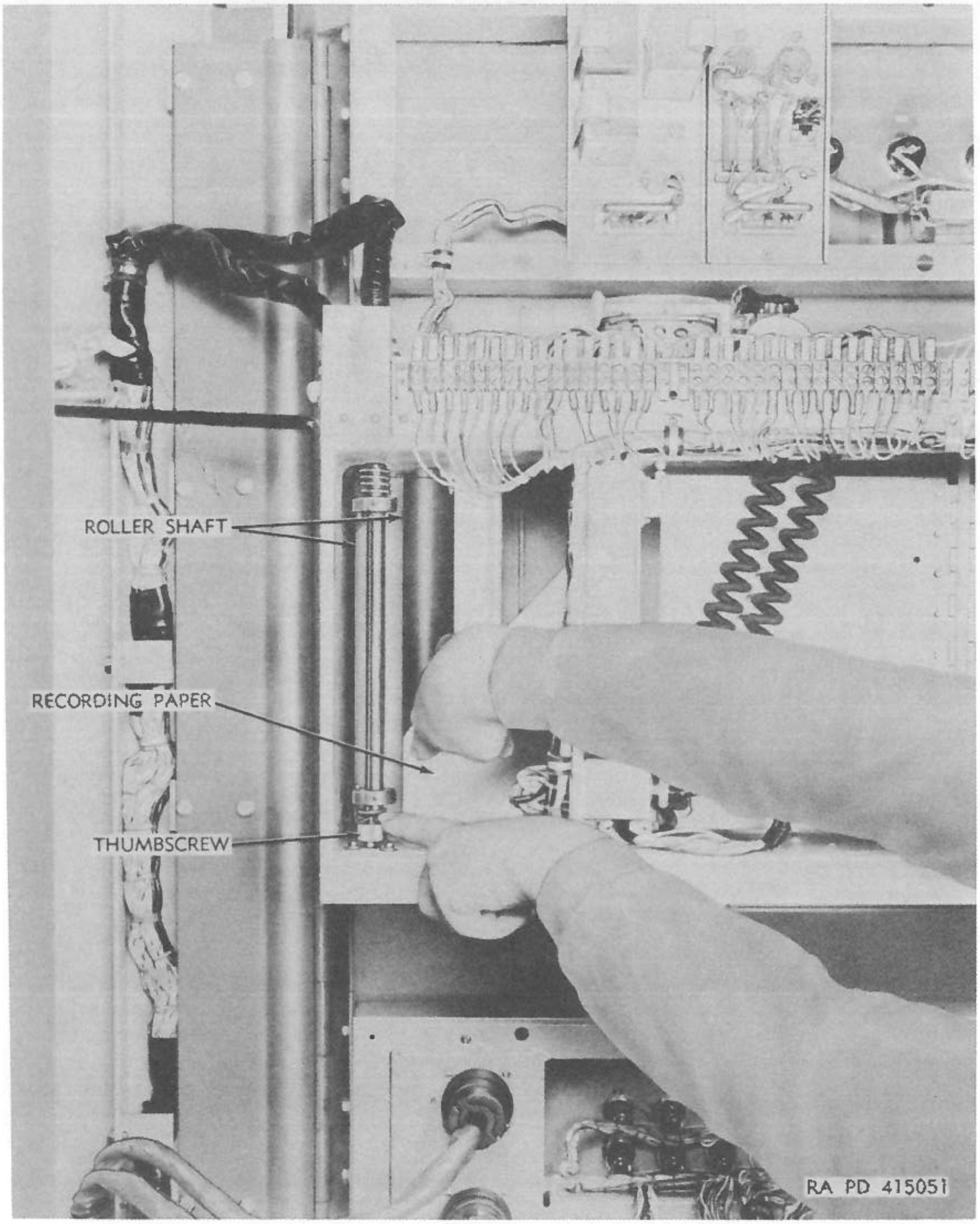

Figure 137. Threading recording paper between roller shafts.

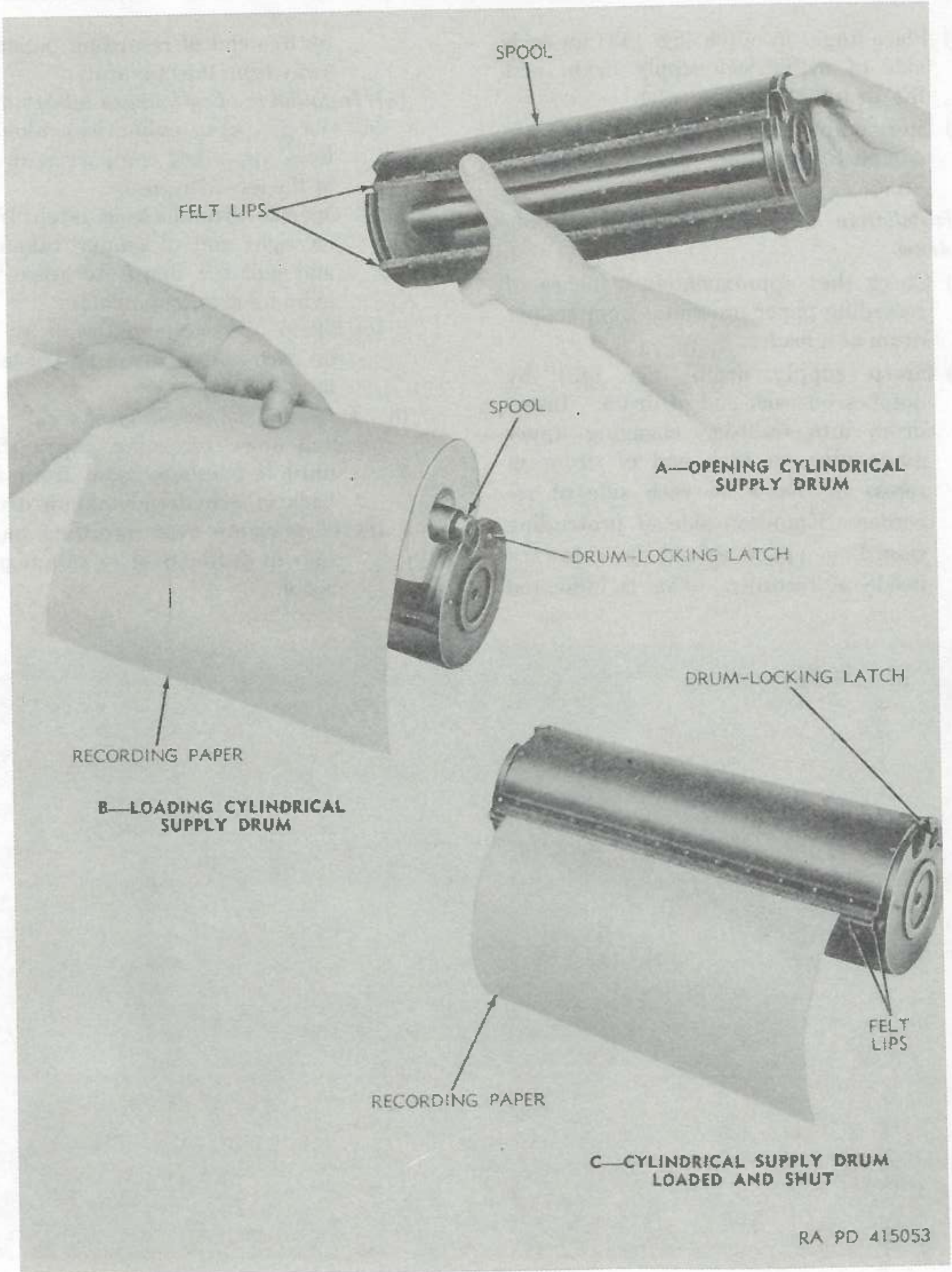

Figure 138. Loading recording paper into cylindrical supply drum.

(a) Place finger in notch (fig. 143) on each side of cylindrical supply drum and lift drum out of recorder.

(b) Store empty supply drum in upper left compartment (fig. 22) of recorder group.

(4) *Installation of loaded cylindrical supply drum.*

(a) Check that approximately 6 inches of recording paper protrudes from supply drum as a leader.

(b) Grasp supply drum (fig. 143) by notches on each end of drum. Insert drum into recorder, engaging upper guide pins on each end of drum in recess in plates on each side of recorder. Emulsion side of protruding recording paper should face toward inside of recorder. This is indicated by free end of recording paper curling away from the operator.

(5) *Installation of cylindrical takeup drum.*

(a) Obtain empty cylindrical takeup drum from upper left compartment (fig. 22) of the recorder group.

(b) Operate drum-locking latch (fig. 144) on right end of empty takeup drum and pull felt lips fully apart to open cylindrical takeup drum.

(c) Grasp open takeup drum by notches on each end of drum and insert drum into recorder.

(6) *Threading the recording paper.*

(a) Pull down recording paper (fig. 140) until it overlaps spool from front to back in cylindrical takeup drum.

(b) Press clamp over recording paper and takeup drum spool to retain paper on spool.

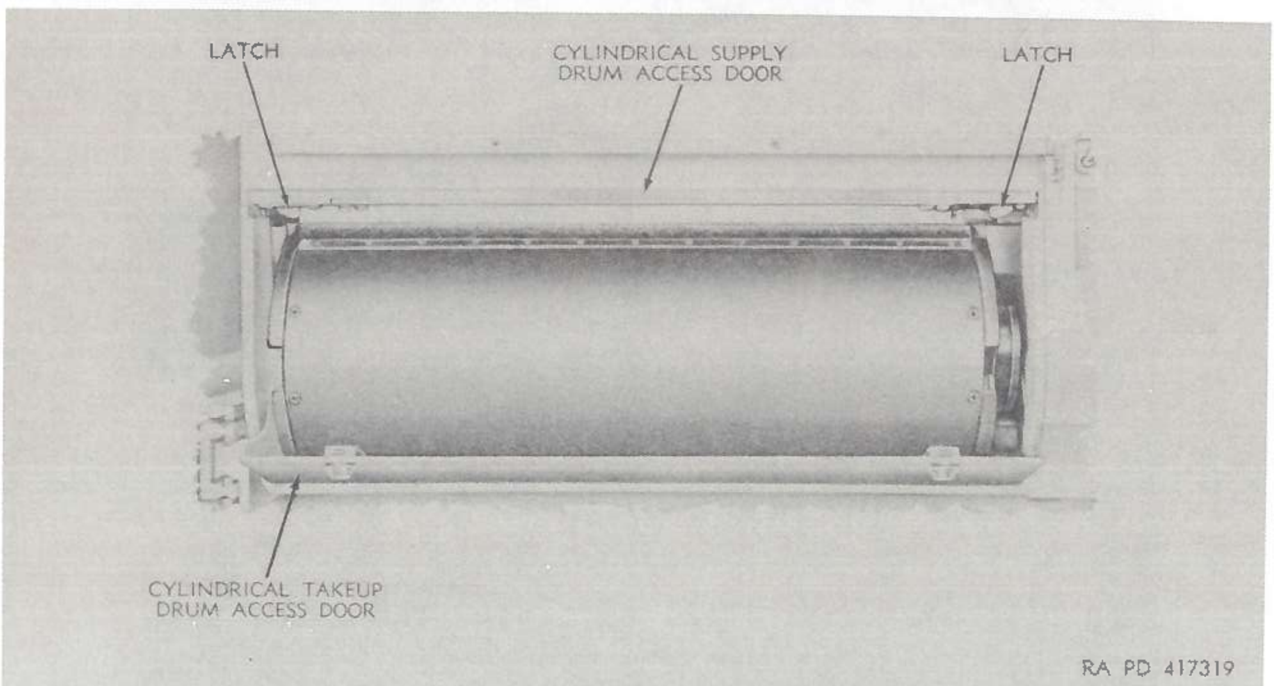

Figure 139. Multichannel data recorder, partial view, cylindrical takeup drum access door open.

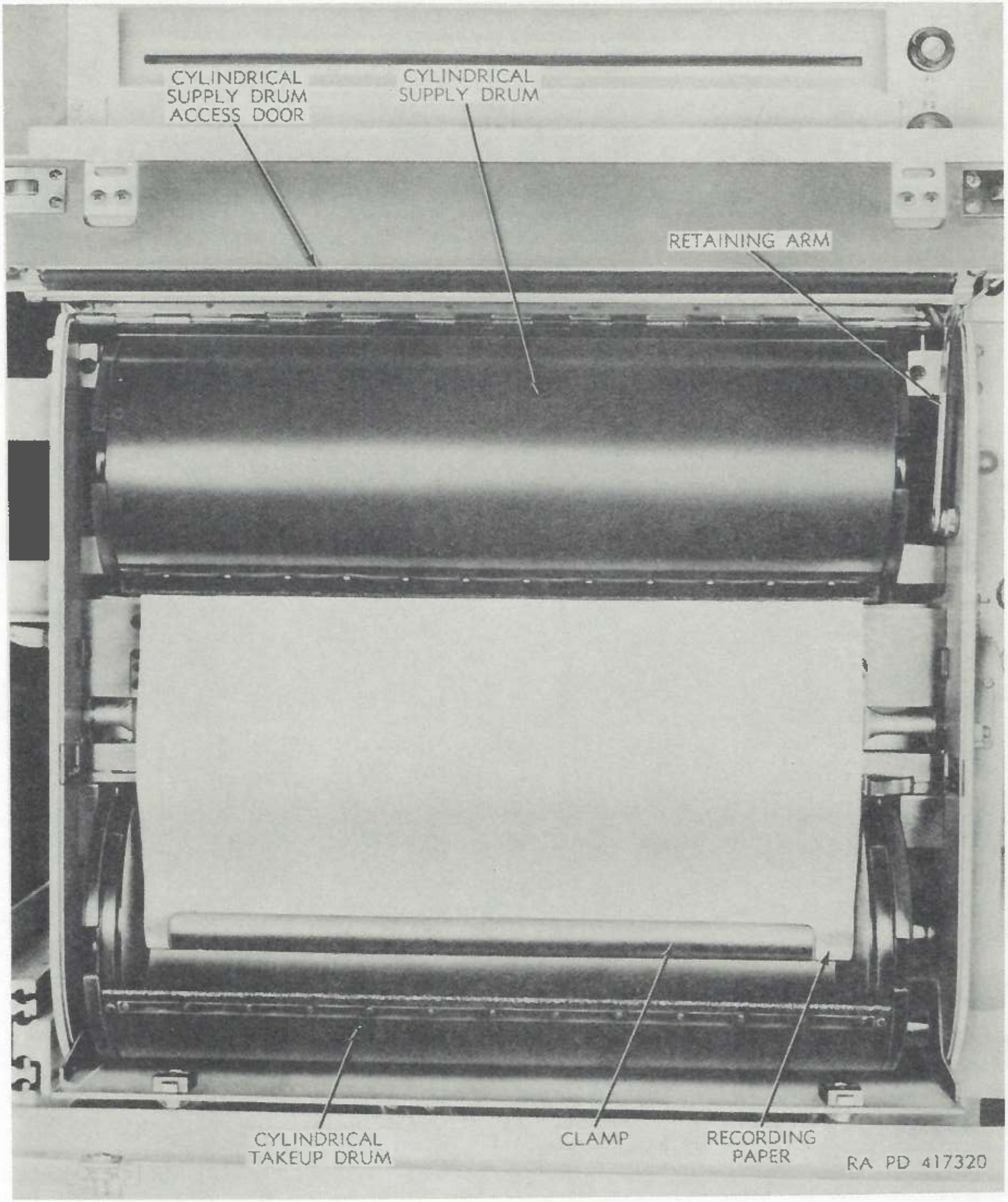

Figure 140. Multichannel data recorder, partial view, loaded.

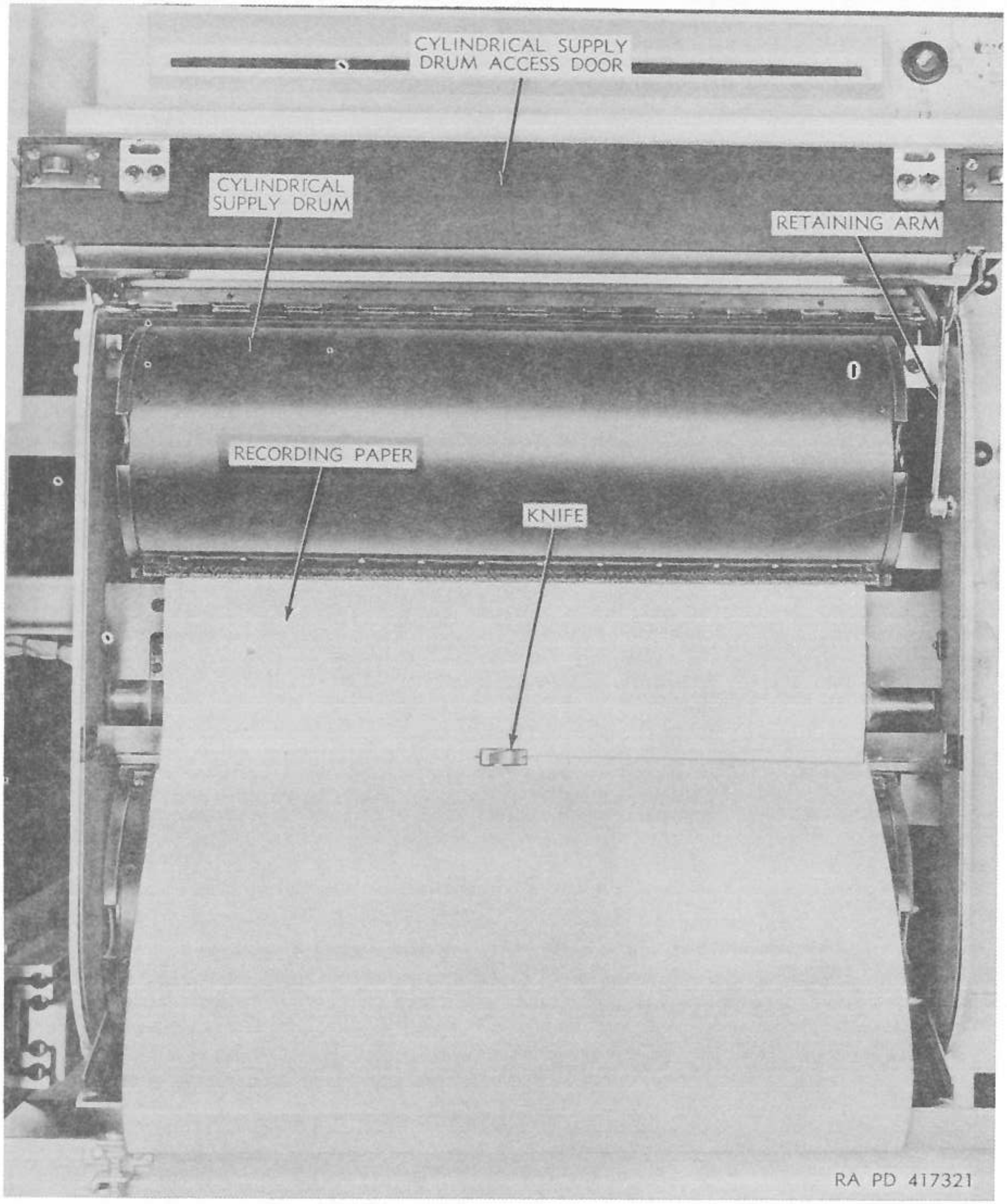

Figure 141. Multichannel data recorder, partial view, cutting of recording paper.

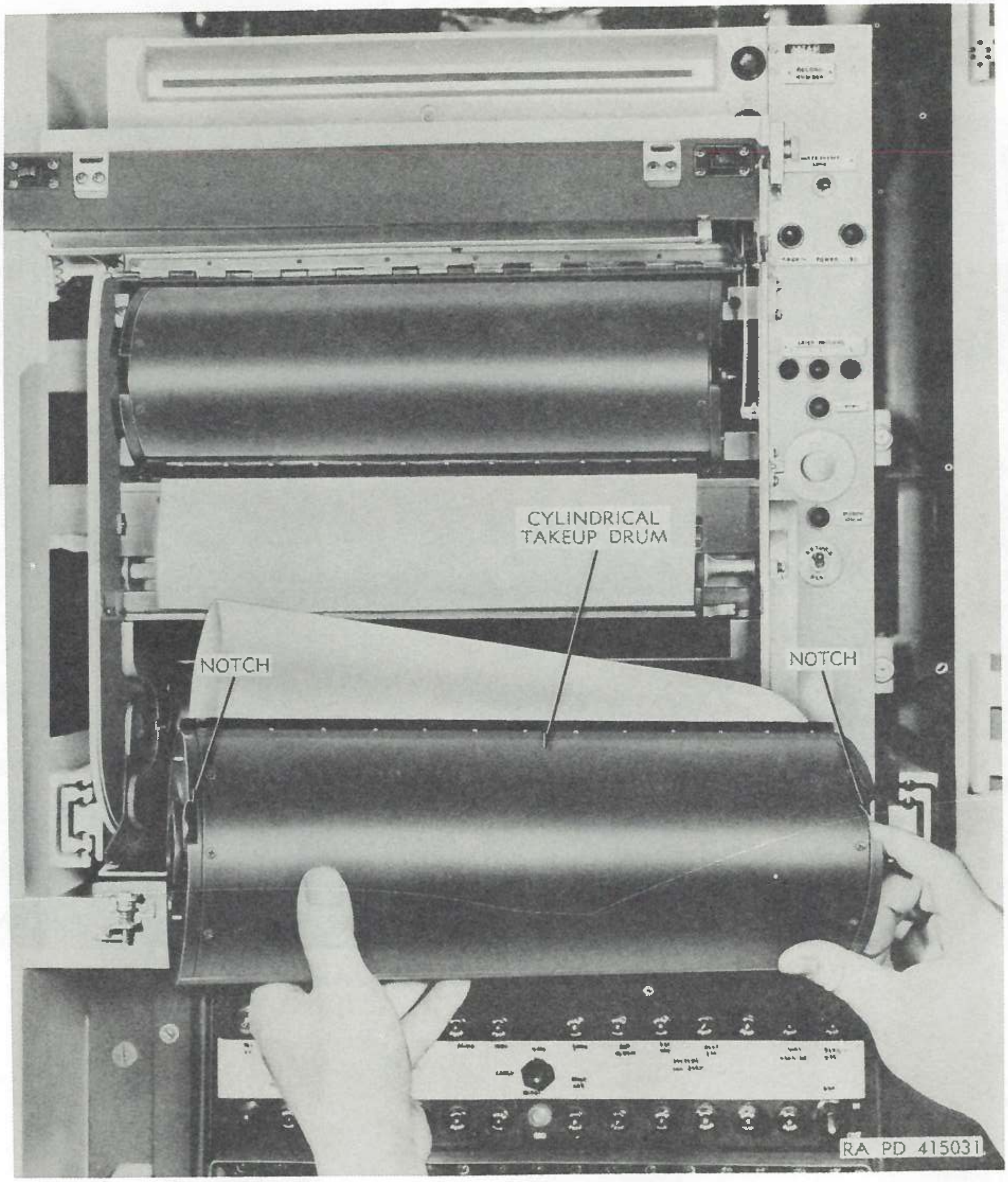

Figure 142. Removing cylindrical takeup drum.

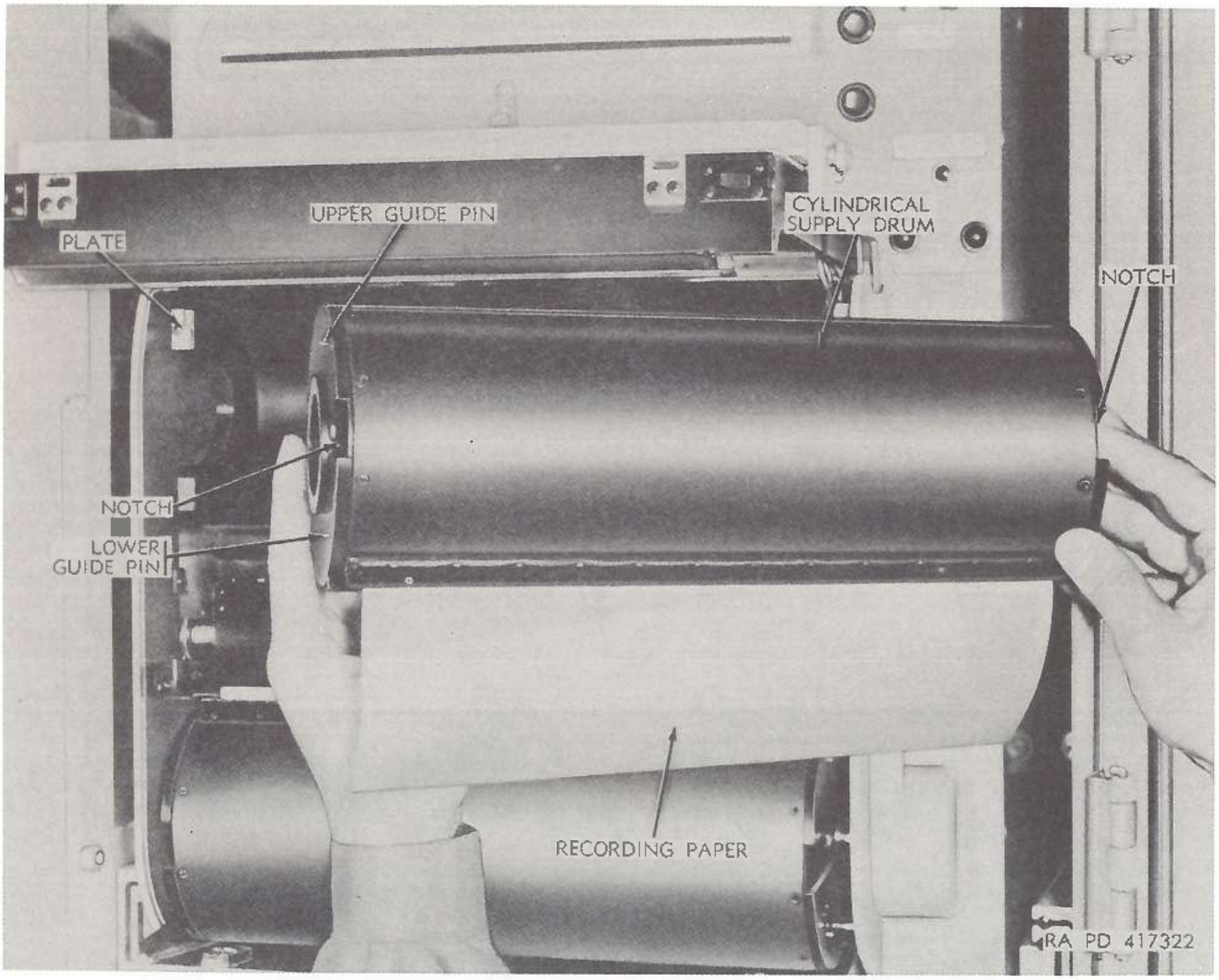

Figure 143. Removing and installing cylindrical supply drum.

(c) Close takeup drum. Make certain drum-locking latch (fig. 144) snaps closed and felt lips lock together.
(d) Press on lower portion of retaining arm (fig. 140) and pull cylindrical supply drum access door down to close.
(e) Close cylindrical takeup drum access door. Make certain door locks.
(f) Manually set film footage counter (R, fig. 72) to indicate number of feet of recording paper in cylindrical supply drum (fig. 140). There are 200 feet of recording paper in a complete roll.

(7) Checking action of cylindrical takeup drum.

(a) Set OPERATE-TEST switch (N, fig. 72) to TEST.
(b) Set RECORD-VIEW switch (K, fig. 72) to RECORD.
(c) Open cylindrical takeup drum access door (fig. 139) approximately 1 inch and feel recording paper to determine if it is feeding into takeup drum. Using flashlight, check that right end of takeup drum spindle is turning.
(d) Close takeup drum access door.
(e) Allow recording paper to feed for approximately 30 seconds.
(f) Set OPERATE-TEST switch (N, fig. 72) to OPERATE.

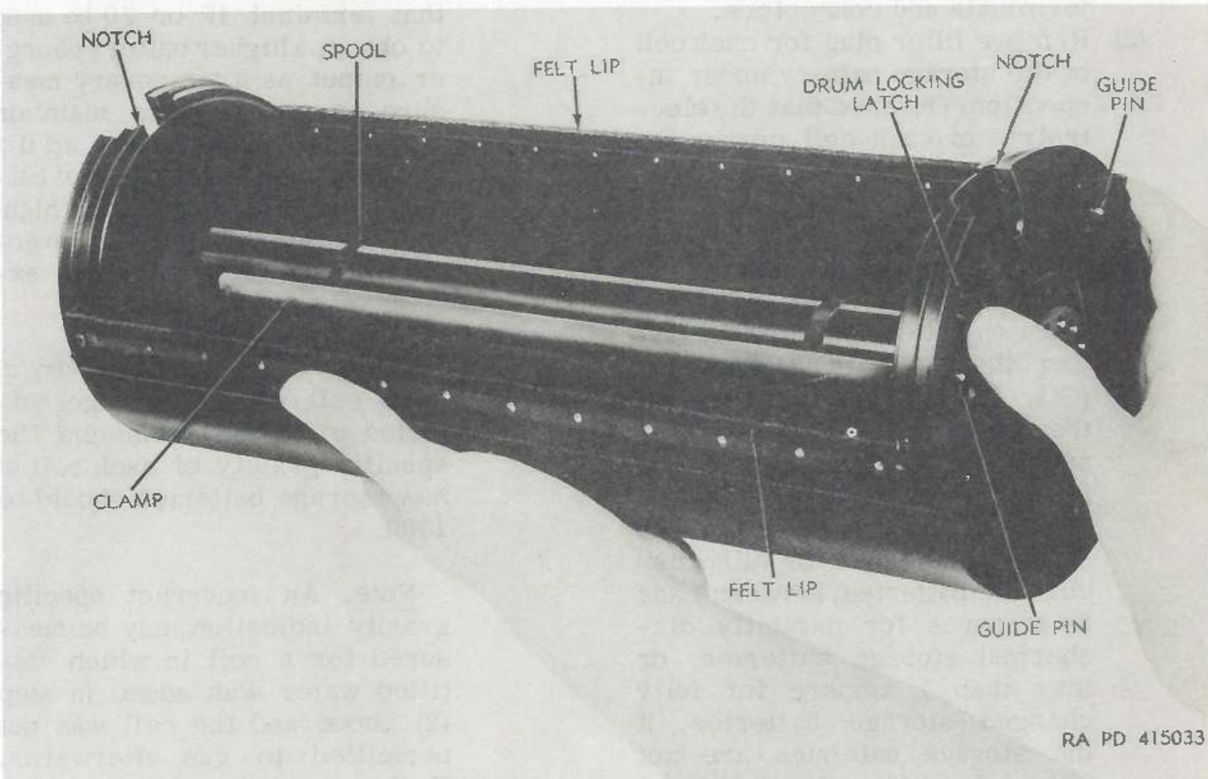

Figure 144. Opening cylindrical takeup drum.

128.1 Heating Equipment Service Information

a. Loosen the four knurled knobs securing the two storage battery mounting frames in the lower right compartment of the heating equipment cabinet.

b. Extend the storage battery mounting frames forward as required to permit performance of the procedures given in (1) through (7) below.

(1) Inspect storage battery terminals, cables, hold down brackets, shelves and compartment for corrosion. Clean and neutralize all affected areas with a baking soda solution. Apply vaseline to the storage battery terminals and connectors.

(2) Remove filler plug for each cell of the storage battery under inspection. Observe that the electrolyte of each cell covers the top of each cell plate by three-sixteenths of an inch. Add distilled water as required until the electrolyte of each cell is at the specified level.

(3) Turn on battery charger by setting the MAIN POWER switch (GG, fig. 70) on the front of the acquisition power control panel (fig. 19) to ON. Observe that the AMMETER (F, figs. 69.2 and 69.3) indicates between 8 and 10 amperes for fully discharged batteries, between 1 and 8 amperes for partially discharged storage batteries, or less than 1 ampere for fully charged storage batteries. If the storage batteries are not fully charged, allow battery charger to restore them to a fully charged condition. Observe that each cell of the storage batteries does not gas excessively when fully charged.

Note. The selenium rectifier of the battery charger may be connected to terminal 18, 19; or 20 (normal, medium, or high output) of terminal board E2 on the left side rear of the upper right compartment in the heating cabinet. Under practically all conditions, the selenium rectifier should be connected to terminal 18 for the correct battery charger output to restore and maintain the storage batteries in a fully charged condition. However, an aging rectifier, aging storage batteries, or a frigid climate may require that terminal 19 or 20 be used to obtain a higher battery charger output as a temporary measure to restore and maintain the storage batteries in a fully charged condition. If the battery charger output is too high, the storage batteries overcharge and the cells gas excessively.

(4) Measure the specific gravity of each cell of the storage batteries using a hydrometer. The specific gravity of each cell of new storage batteries should be 1300.

Note. An incorrect specific gravity indication may be measured for a cell in which distilled water was added in step (2) above and the cell was not permitted to gas afterwards. If this condition exists, allow the battery charger to continue to operate until the cell to which distilled water was added gasses, and repeat the specific gravity test.

(5) Set the MAIN POWER switch (GG, fig. 70) on the front panel of the acquisition power control panel to OFF.

(6) Replace filler plug of each cell of the storage batteries.

(7) Depress the release levers under the storage battery mounting frames and slide the storage battery mounting frames in the storage battery compartment. Tighten the four knurled knobs of the storage battery mounting frames.

128.2 (U). Elevation, Azimuth, or Range Indicator Service Information—Systems 1202 and Above

a. Remove the cover (fig. 144.1) from the lock plates (fig. 144.1) of the indicator dial on the elevation, azimuth, or range indicator

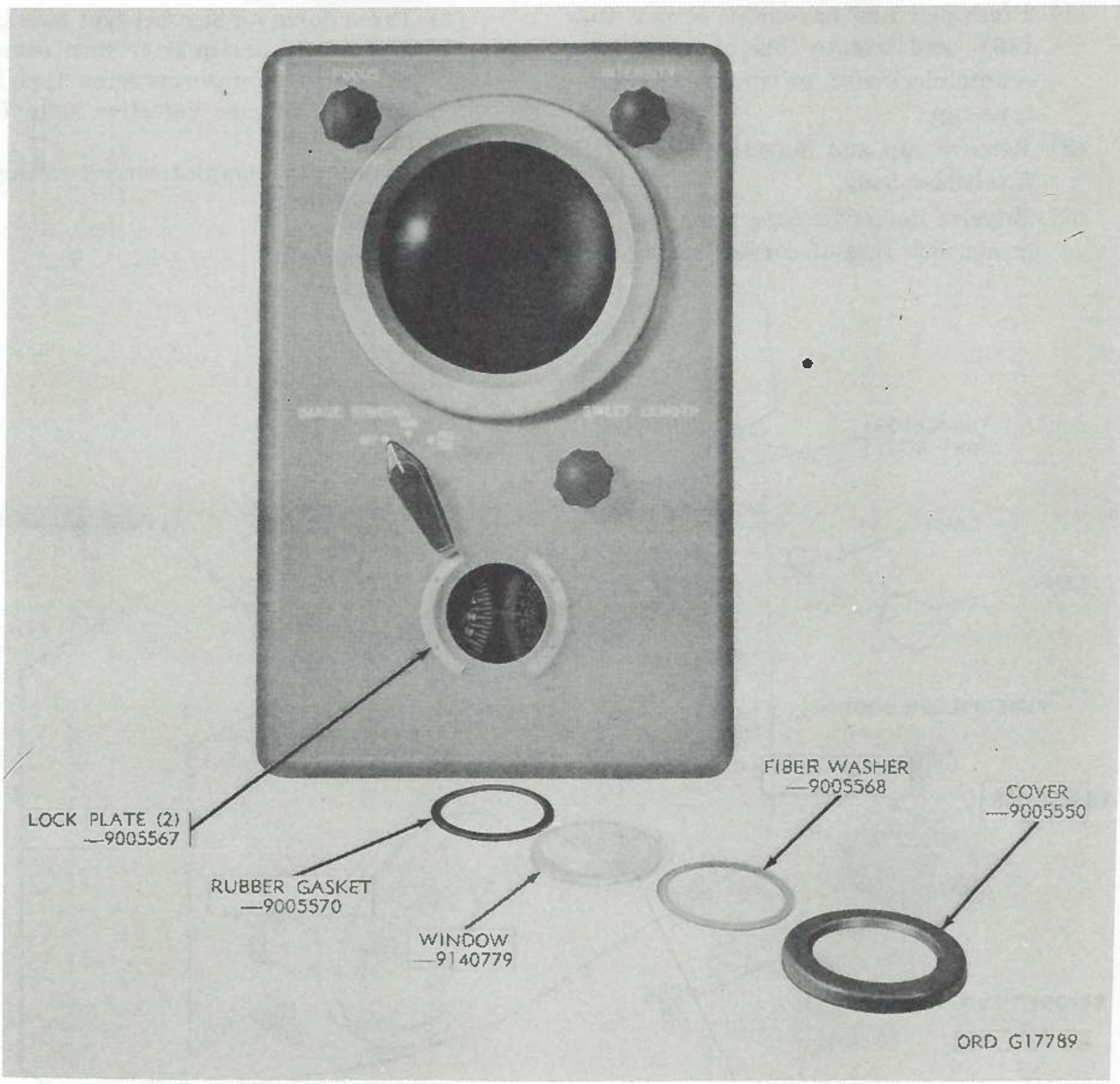

Figure 144.1 (U). Elevation, azimuth, or range indicator—indicator dial window disassembled—systems 1202 and above. (U).

front panel by rotating the cover counterclockwise. Collect the fiber washer, plastic window, and rubber gasket.

b. Clean the plastic window with water and dry with a lint-free cloth.

c. Position the fiber washer, plastic window, and rubber gasket in the cover in the sequence shown in figure 144.1. Secure the assembled parts to the lock plates by rotating the cover clockwise on the lock plates.

Section III (U). CORRECTIVE MAINTENANCE

129 (U). Replacement of Fuses and Lamps

Note. The key numbers shown in parentheses in *a* and *b* below refer to figure 145.

a. Typical Replacement of Front Panel Fuses.

(1) Press down on bayonet-type cap (fig. 145) and rotate one-quarter turn counterclockwise or unscrew screw-type cap.

(2) Remove cap and defective fuse from fuseholder body.

(3) Remove defective fuse from cap and insert new fuse of correct rating.

(4) Install fuse and cap in fuseholder body.

b. Typical Replacement of Front Panel Lamps.

(1) Unscrew lens (fig. 145) from indicator light body.

(2) Press down on bayonet type base lamp and rotate one-quarter turn counterclockwise, or unscrew screw type base lamp to remove defective lamp from socket.

(3) Install new lamp of correct rating.

(4) Install lens.

130 (U). (Deleted)

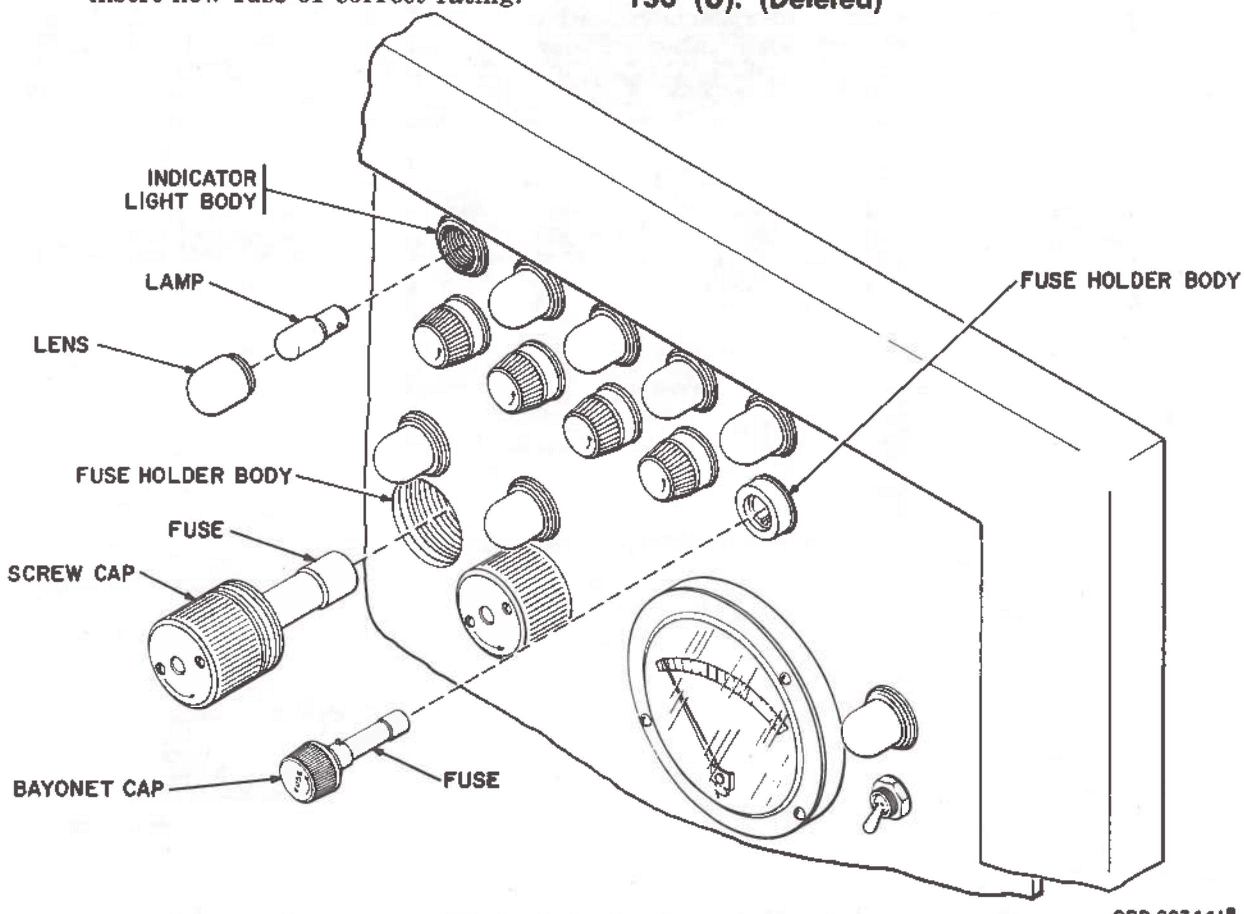

Figure 145. (U) Front panel lamps and fuses—typical exploded view. (U).

Next numbered page is 429.

CHAPTER 8 (U)

DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

131 (U). General

a. Destruction of the radar course directing central, when subject to capture or abandonment in the combat zone, will be undertaken by the using arm only when, in the judgment of the unit commander concerned, such action is necessary in accordance with orders of, or policy established by, the army commander.

b. The information which follows is for guidance only. Certain of the procedures outlined require the use of explosives and incendiary grenades which normally may not be authorized items of issue to the using organization. The issue of these and related materials, and the condition under which destruction will be effected, are command decisions in each case, according to the tactical situation. Of the several means of destruction, those most generally applicable are:

Mechanical	Requires axe, pick mattock, sledge, crowbar, or similar implement.
Burning	Requires gasoline, oil, incendiary grenades, or other flammables, or welding or cutting torch.
Demolition	Requires suitable explosives or ammunition.
Gunfire	Includes artillery, machine guns, rifles using rifle grenades, and launchers using antitank rockets. Under some circumstances hand grenades may be used.

In general, destruction of essential parts, followed by burning will usually be sufficient to render the materiel useless. Selection of the particular method of destruction requires imagination and resourcefulness in the utilization of the facilities at hand under the existing conditions. Time is usually critical.

c. If destruction to prevent enemy use is resorted to, the materiel must be so badly damaged that it cannot be restored to a usable condition in the combat zone, either by repair or by cannibalization. Adequate destruction requires that all parts essential to the operation of the materiel, including essential spare parts, be destroyed or damaged beyond repair. For components with security classification, complete destruction beyond identifiability is required. However, when lack of time and personnel prevents destruction of all parts, priority is given to the destruction of those parts having a security classification and those parts most difficult to replace. Equally important, the same essential parts must be destroyed on all like materiel so that the enemy cannot construct one complete unit from several damaged ones.

d. If destruction by demolition or gunfire is directed, due consideration should be given to:

(1) Selection of a point of destruction that will cause the greatest obstruction to enemy movement and also prevent hazard to friendly troops from fragments or richocheting projectiles which may occur incidental to the destruction.

(2) Observance of appropriate safety precautions.

132 (U). Destruction of the Radar Course Directing Central

a. General. The methods of destruction contained herein cover the equipment of the radar course directing central. Ordinarily, the equipment will be destroyed with its trailer or undercarriage (if mounted thereon) as a complete unit. If time, personnel, and materials are limited, priority shall be given to the destruction of the equipment since sufficient concurrent damage will be incurred by the trailers and undercarriages to render them useless.

b. Tactical Publications. All technical publications, schematics, and other flammable material must be completely burned.

Warning: **All electrical items should be completely disconnected from sources of electrical energy to preclude injury to personnel from contact with high-voltage conductors or capacitors holding dangerous potentials or from premature detonation of explosives when destruction is to be accomplished by demolition.**

In addition, capacitors should be discharged and grounded prior to destruction of the materiel by any method other than gunfire.

133(U). Method No. 1—By Burning

a. Open all doors, drawers, and cabinets on the equipment.

b. Using an axe, pick mattock, sledge, or other heavy implement, smash beyond recognition the vital elements only of all the equipment listed in paragraph 135*a* through *g*. Since smashing will be followed by burning, it is not essential to perform all of the smashing recommended in paragraph 135.

c. Place large quantities of combustible such as rags, paper, or wood in all units of the equipment. Pour gasoline or oil over the combustible and the equipment.

d. Ignite by means of an incendiary grenade fired from a safe distance, by a burst from a flame thrower, a combustible train of suitable length, or other appropriate means. Take cover immediately. A hot fire is required to render the materiel useless.

***Caution:* When igniting gasoline, due consideration should be given to the highly flammable nature of gasoline and its vapor. Carelessness in its use may result in painful burns.**

Elapsed time: about 15 minutes.

134 (U). Method No. 2—By Demolition

a. Planning for simultaneous detonation, prepare 35 demolition charges, using 1-pound TNT blocks or equivalent together with the necessary detonating cord to make up the required charges.

a.1. Place test equipment and spare components and assemblies in an available storage cabinet or in a location where destruction is assured.

b. Place the charges for each piece of equipment as indicated below:

Equipment	Size of charge (In pounds)	Placement of charge
Acquisition antenna-receiver-transmitter group.	3	Place within antenna pedestal.
	3	Place within receiver transmitter.
	3	Place within modulator.
	2	Place adjacent to IFF control box.
Target track or missile track antenna-receiver-transmitter group.	2	Place on receiver-transmitter.
	1	Fasten to antenna by means of tape or cord.
	2	Place on left trunnion of pedestal.
	2	Place on right trunnion of pedestal.
	3	Place on pedestal base.
Trailer mounted director station.	2	Place within computer amplifier-relay group.
	1	Place within servo computer assembly.
	1	Place within computer power supply group.
	3	Place within battery control console.
	1	Place within recorder group.
	2	Place within director station group.
	1	Place within personnel heater.
	2	Target data processing unit.
	1	Place within battery control interconnecting box.
Trailer mounted tracking station	3	Place within missile radar control console.
	3	Place within radar set group.
	3	Place within target radar control console.
	1	Place within radar power supply group.
	1	Place within equipment cooling cabinet.
	1	Place within personnel heater.

Equipment	Size of charge (in pounds)	Placement of charge
Electronic shop	2	Place within personnel heater.
	1	Place a 1-pound charge within each storage cabinet (six).
Engine generator	2	Place on main generator.
	3	Place on left side of engine.
	3	Place on right side of engine.
Antenna and mast group and radar test set.	1	Place on the radar test set, adjacent to the mast.

c. Connect the charges for simultaneous detonation with detonating cord.

d. Provide for dual priming to minimize the possibility of a misfire.

e. Detonate the charges. For complete details on the use of demolition materials and methods of priming and detonating demolition charges, refer to FM 5-25. Training and careful planning are essential. The danger zone is approximately 500 yards. Elapsed time: about 20 minutes.

135. Method No. 3—By Mechanical Means

Using an axe, pick mattock, sledge, crowbar, or other heavy implement, smash thoroughly electronic and mechanical elements of the equipment listed in *a* through *g* below. Priority must always be given to the vital elements with the highest security classification.

a. Acquisition Antenna-Receiver-Transmitter Group. Modulator, receiver-transmitter, antenna, antenna pedestal, hydraulic control unit, waveguide on the antenna, and pedestal legs.

b. Target Track or Missile Track Antenna-Receiver-Transmitter Group. Receiver-transmitter, antenna pedestal, antenna, azimuth drive equipment enclosure, and antenna levels.

c. Trailer-Mounted Director Station. Computer amplifier, computer servo, computer power supply, battery control console, acquisition radar assembly, event recorder and switchboard, early warning plotting board, equipment cooling mechanism, and heating and ventilating assembly.

d. Trailer-Mounted Tracking Station. Target console assembly, missile console assembly, radar range and receiver assembly, radar power cabinet assembly, equipment cooling mechanism, and heating and ventilating assembly.

e. Electronic Shop. The repair parts and tools in the cabinets, personnel heater.

f. Engine Generator. Main generator, exciter generator, engine block, cylinder head, engine controls and instruments, generator controls and instruments, and fuel tank.

g. Antenna and Mast Group. Radar test set, stay wires, mast, RF waveguide, and RF horn assembly.

136. Method No. 4—By Gunfire

If appropriate weapons are available, destroy all equipment of the radar course directing central by gunfire, using artillery, rifles using rifle grenades, or rocket launchers using high-explosive rockets. Fire on the radar course directing central, aiming at all portions of the equipment to assure complete destruction of the major units within. Although one well-placed direct hit may render a piece of equipment useless, several hits are usually required for complete destruction.

***Caution:* Firing artillery at ranges of 500 yards or less should be from cover. Firing rifle grenade or high-explosive rockets should be from cover.**

CHAPTER 9 (U)

EQUIPMENT SERVICEABILITY CRITERIA

137 (U). General

This chapter contains the equipment serviceability criteria for the NIKE-HERCULES Radar Course Directing Central. Equipment serviceability criteria are furnished to users to enable them to determine if their equipment can perform its primary mission. The commander is required to evaluate the equipment using these criteria. As a result of this evaluation, he will rate the equipment in one of two categories:

a. Green. Combat equipment free of any condition limiting the reliable performance of its primary mission.

b. Red. Combat equipment unable to perform its primary mission immediately or equipment which is unreliable.

138 (U). Evaluating

Evaluation of the NIKE-HERCULES Radar Course Directing Central is determined by user personnel while performing the operational check procedures contained in TM 9-1430-250-12, TM 9-1430-251-12, and TM 9-1430-252-12 2.

139 (U). Recording

Record the results of the evaluation on DA Form 2404 in accordance with the instructions contained in TM 38-750 and AR 750-10.

APPENDIX I (U)

REFERENCES

1 (U). Publications Indexes

The following indexes should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to materiel covered in this manual.

Index of Army Motion Pictures, Film Strips, Slides and Phono Recordings	DA Pam 108-1
Index of Administrative Publications	DA Pam 310-1
Index of Blank Forms	DA Pam 310-2
Index of Graphic Training Aids and Devices	DA Pam 310-5
Index of Ordnance Corps Supply Manuals	DA Pam 310-29
Index of Tables of Organizations and Equipment, Tables of Organizations, Type Tables of Distribution, and Tables of Allowances	DA Pam 310-7
Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders	DA Pam 310-4
Index of Training Publications	DA Pam 310-3

2 (U). Supply Manuals

The following supply manuals of the Department of the Army Supply Manuals pertain to this materiel:

a. Destruction To Prevent Enemy Use.

Ammunition Explosives, Bulk Propellants, and Explosive Devices	SM 9-5-1375

b. General.

Introduction	ORD 1

3 (U). Forms

The following forms pertain to this materiel:

DA Form 5-31, Shop Job Order Register
DA Form 9-1, Materiel Inspection Tag
DA Form 9-12, Inspection of Ordnance Equipment
DA Form 9-79, Parts Requisition
DA Form 9-80, Job Order File
DA Form 9-81, Exchange Part or Unit Identification Tag
DA Form 9-110, Guided Missile Component Evaluation Data Report
DA Form 11-3, Shop Tag
DA Form 421, Stock Record Card
DA Form 461-5, Limited Technical Inspection
DA Form 468, Unsatisfactory Equipment Report
DA Form 829, Rejection Memorandum
DA Form 1546, Request for Issue or Turn-In
DA Form 2028, Recommended Changes to DA Technical Manual Parts Lists or Supply Manual 7, 8, or 9
DD Form 6, Report of Damaged or Improper Shipment
DD Form 250, Materiel Inspection and Receiving Report
DD Form 787, Electronic Failure Report
DD Form 787-1, Electronic Failure Report—Signal Equipment

4 (U). Other Publications

The following explanatory publications contain information pertinent to this materiel and associated equipment:

a. Camouflage.

Camouflage, Basic Principles	FM 5-20

b. Decontamination.

Decontamination	TM 3-220
Defense Against CBR Attack	FM 21-40

c. Destruction To Prevent Enemy Use.

Demolition Materials	TM 9-1946
Explosives and Demolitions	FM 5-25

d. General.

Accident Reporting and Records	AR 385-40
Army Safety Policy	AR 385-10
Authorized Abbreviations and Brevity Codes	AR 320-50
Dictionary of United States Army Terms	AR 320-5
Electronic Failure Report	AR 700-39
First Aid for Soldiers	FM 21-11
Guided Missile Component Evaluation Data Report	AR 700-37
Military Symbols	FM 21-30
Military Training	FM 21-5
Ordnance Direct Support Service	FM 9-3
Ordnance General and Depot Support Service	FM 9-4
Ordnance Major Item and Major Combinations and Pertinent Publications	SB 9-1
Regulations for Firing Ammunition for Training, Target Practices, and Combat	AR 385-63 AFR 50-13
Report of Malfunctions and Accidents Involving Ammunition and Explosives (During Training and Combat)	AR 700-1300-8
Special Operation: Northern Operations (Initial Draft)	FM 31-71
Techniques of Military Instruction	FM 21-6
Unsatisfactory Equipment Report	AR 700-38

e. Operation and Maintenance.

Assembly and Emplacement: Guided Missile Launching Set (NIKE-HERCULES Air Defense Guided Missile System)	TM 9-1440-251-10
Check Procedures: Acquisition Radar System (NIKE-HERCULES Air Defense Guided Missile System) (Includes check sheets)	TM 9-1430-250-12/1
Check Procedures: Computer System and Data Recorder (NIKE-HERCULES and IMPROVED NIKE-HERCULES Air Defense Guided Missile System) (Includes check sheets)	TM 9-1430-251-12
Check Procedures: Missile Tracking and Target Tracking Radar Systems and Radar Test Set TS-847A/MSW-1 (NIKE-HERCULES Air Defense Guided Missile System) (Includes check sheets)	TM 9-1430-252-12/2
Operators and Organizational, Field and Depot Maintenance Manual: Trailers and Vehicular Compartment Heater HD-365/M (9005301) (NIKE-AJAX and NIKE-HERCULES Air Defense Guided Missile System)	TM 9-2330-212-14
Operators and Organizational Maintenance Manual: Voice Communications Systems (NIKE-HERCULES and IMPROVED NIKE-HERCULES Air Defense Guided Missile System)	TM 9-1400-251-12
Operators Manual: Guided Missile Launching Set (NIKE-HERCULES Air Defense Guided Missile System) (Including Elevators)	TM 9-1440-250-10
Organizational Maintenance: Checks and Adjustments: Radar Course Directing Central (NIKE-HERCULES Air Defense Guided Missile System)	TM 9-1430-251-20/1
Over-all System Description (NIKE-HERCULES Air Defense Guided Missile System)	TM 9-1400-250-10/1
Cleaning of Ordnance Materiel	TM 9-208-1
Engine, Diesel, Cummins Model J1S-600	TM 5-5432-1
Heater Cabinet, Duct-Type Vehicle Mounting Heater, Heating and Ventilating Cabinet, Switchboard Cabinet, Early-Warning Plotting Board T17 and Data Junction Plate	TM 9-6093-12
Inspection of Ordnance Materiel in Hands of Troops	TM 9-1100
Instruction Guide: Ordnance Preservation, Packaging, Storage and Shipping	TM 9-1005
Instruction Guide: Operation and Maintenance of Ordnance Materiel in Extreme Cold (0° to −65° F.)	TM 9-2855
Lubrication	TM 9-2835
Interrogator Set, AN/TPX-20	TM 11-1191
Maintenance and Care of Hand Tools	TM 9-867
Multimeter TS-352/U, TS-352A/U and TS-352B/U	TM 11-5527

Operation and Organizational Maintenance: Generator Set, Electric, Portable, Diesel Driven, Skid Mounted, AC, 45KW, 60 Cycle, Convertible Portable, Diesel Driven, Skid Mounted, AC, 45KW, 60 Cycle, Convertible to 37.5 KW, 50 Cycle, Winterized, Cummins Model JSFA-601-45-KW-60/50, Cycles SF-45-D (less engine)	TM 5-5321-1
Operation and Organizational Maintenance: Generator Set, Electric, Portable, Diesel Driven, Skid Mounted, AC, 45 KW, 400 Cycle, Winterized, Cummins Engine Model JSGA-601, 45 KW, 400 Cycle HF-45-D (less engine)	TM 5-5329-1
Operator's manual: Decoder group AN/TPA-3(U)	TM 11-5840-202-10
Ordnance Maintenance: Materials Used for Cleaning, Preserving, Abrading, and Cementing Ordnance Materiel, and Related Items Including Chemicals, Lubricants, Indicators, and Hydraulic Fluids	TM 9-247
Painting Instructions for Field Use	TM 9-2851
Recognition Signal Simulator SM-104/TPX; Operator's Manual	TM 11-5840-204-10

f. Technical Bulletins.

Interrogator set AN/TPX-27 and IFF Mark X (SIF) system (U)	TB 11-1191-1
Operation of Signal Equipment at Low Temperatures	TB SIG 219
Winter Maintenance of Signal Equipment	TB SIG 66

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APPENDIX II (U)

FIRST ECHELON TOOLS, EQUIPMENT, AND REPAIR PARTS (U)

The basic issue items for all maintenance and repair operations authorized for the first echelon appear in the following publications.

Operator and Organizational Maintenance: Repair Parts and Special Tool Lists Illustration Supplement for Radar Course Directing Central Antenna-Receiver-Transmitter Group, Acquisition OA–1601/T, OA–1596/T, OA–4343/TP, OA–4428/TP, and A-Frame, Vehicle Mounting (NIKE–HERCULES/Improved HERCULES Air Defense Guided Missile System)	TM 9–1430–250–12P/2/2
Operator and Organizational Maintenance: Repair Parts and Special Tool Lists Illustration Supplement for Radar Course Directing Central Antenna-Receiver-Transmitter Group, Missile Tracking, Trailer Mounted OA–1340/MPA, OA–1340/MPS (NIKE–HERCULES/Improved HERCULES Air Defense Guided Missile System)	TM 9–1430–250–12P/3/2
Operator and Organizational Maintenance: Repair Parts and Special Tool Lists Illustration Supplement for Radar Course Directing Central Director Station, Guided Missile, Trailer Mounted AN/MSA–19, AN/MSA–23, AN/MSA–23A, AN/MSA–23B, AN/MSA–25, AN/MSA–25A, AN/MSA–26 and AN/MSA–26A (NIKE–HERCULES Air Defense Guided Missile System)	TM 9–1430–250–12P/4/2
Operator and Organizational Maintenance: Repair Parts and Special Tool Lists Illustration Supplement for Radar Course Directing Central Tracking Station, Guided Missile, Trailer Mounted AN/MPA–5, AN/MPA–6, AN/MPA–6A, and AN/MPA–7 (NIKE–HERCULES Air Defense Guided Missile System)	TM 9–1430–250–12P/5/2
Organizational Maintenance Allowances for Test Set, Radar TS–847A/MSW–1	ORD 7 SNL Y 4–4

Next numbered page is 437.

(U) INDEX

[AG 413.44 (8 Dec 58)]

By Order of *Wilber M. Brucker*, Secretary of the Army:

MAXWELL D. TAYLOR,
General, United States Army.
Chief of Staff.

Official:

R. V. LEE,
Major General, United States Army.
The Adjutant General.

Distribution:

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DCSLOG (1)
Technical Stf, DA (1) except CofOrd (7)
Ord Bd (2)
USCONARC (3)
US ARADCOM (2)
US ARADCOM Regn (2)
OS Maj Comd (5)
OS Base Comd (2)
Log Comd (3)
MDW (1)
Armies (3)
Corps (2)
Svc Colleges (2)
Br Svc Sch (2) except USA Ord Sch (5), USAAMS (5), US ARADSCH (100)
USAOGMS (70)
Gen Depots (1) except Atlanta Gen Depot (None), Columbus Gen Depot (None)
Ord Sec, Gen Depots (1) except Ord Sec, Atlanta Gen Depot (None), Ord Sec, Columbus Gen Depot (None)
Ord Depots (1)
Ord Ammo Comd (1)
Ports of Emb (OS) (2)
Trans Terminal Comd (2)
Army Terminals (2)
OS Sup Agcy (1)
Ord PG (10)
Ord Arsenals (1) except Redstone Arsenal (30), Raritan Arsenal (25)
Ord Proc Dist (1) except Springfield Ord Proc Dist (None), Rochester Ord Proc Dist (None), Pittsburgh Ord Proc Dist (None)
Fld Comd, AFSWP (20)
Units organized under following TOE's:
9–12 (1)
9–17 (1)
9–45 (1)
9–46 (1)
9–47 (1)
9–57 (1)
9–76 (3)
9–227 (3)
9–229 (3)
9–377 (1)
9–500 (DD) (3)
9–510 (FA) (3)
44–145 (3)
44–146 (3)
44–147 (3)
44–445 (3)
44–446 (3)
44–447 (3)
44–448 (3)

NG: None.

USAR: None.

For explanation of abbreviations used, see AR 320–50.

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