CHAPTER 3 (C)
RADAR COURSE DIRECTING CENTRAL

Section I (C). FUNCTIONAL DESCRIPTION

17 (U). General

The radar course directing central (RCDC) consists of the ground guidance equipment located in the battery control area (fig. 8). The functional relationships of the major subsystems of the RCDC are illustrated in figure 9. Each block represents a functional subsystem of the RCDC except the blocks that are shown with broken lines. The tactical control system relays tactical control data, consisting of information and orders, among all areas of the Improved NIKE–HERCULES System or the NIKE–HERCULES ATBM System.

18 (C). Functional Analysis

Note. The function of the RCDC in the NIKE–HERCULES ATBM System is the same as that of the RCDC in the Improved NIKE–HERCULES System.

a. In a surface-to-air mission, the high power acquisition radar (HIPAR) (fig. 9), the auxiliary acquisition radar (AAR), and the low power acquisition radar (LOPAR) transmit pulsed RF energy from a continuously rotating, highly directional antenna. An object in the path of the transmitted RF energy reflects a portion of the energy back to the antenna. The acquisition radar system converts the reflected RF energy into video for display on cathode-ray tube indicators. The radar select circuit permits selection of either HIPAR/AAR or LOPAR video for display.

a.1. Anti-jam display (AJD) facilities are provided for both the HIPAR/AAR and the LOPAR systems. In the presence of enemy jamming, the AJD allows the target to remain visible on the cathode-ray tube indicators.

b. An identification friend or foe (IFF) system also is associated with each of the two acquisition radar systems. When IFF identification of an unidentified object is required, the IFF system transmits IFF interrogation pulses to the unidentified object. If the object is a friendly aircraft with IFF equipment, IFF response pulses are transmitted by the aircraft and received by the IFF system. The IFF response pulses are converted into IFF video for display on the cathode-ray tube indicators.

c. Tactical control data from an Army Air Defense Command Post (AADCP) is supplied through either the fire unit integration facility (FUIF) or the battery terminal equipment (BTE) to the tactical control system. If the tactical control data received by the tactical control system from the AADCP or IFF indicates that the unidentified object is an enemy aircraft or missile, the object is designated as a target. Designated target position data, derived from the selected acquisition radar display, is supplied to the target tracking radar (TTR) system.

d. The designated target position data aids the target tracking operators in acquiring the target. The TTR system transmits a beam of RF energy to the designated target and receives the reflected RF energy. The reflected RF energy enables the TTR system to track the target and to provide continuous target position data to the computer system. The TTR system provides antenna position data to the target ranging radar (TTR) system. The TRR system, slaved to the TTR system, also tracks the target by transmitting RF energy and receiving the RF energy reflected from the target. The TRR system supplies range video to the TTR system. The continuous target position data supplied to the computer system consists of azimuth and elevation data from the TTR system and range data from either the TTR or TRR system. The use of two radar systems for range tracking provides advantages in combatting enemy electronic countermeasures (ECM).

e. Tactical control data, such as missile, mission, and warhead designation and the fire command, is supplied to the launching control group from the tactical control system. When a target is being tracked, the computer system continuously calculates a predicted intercept point, determined from the target position data supplied

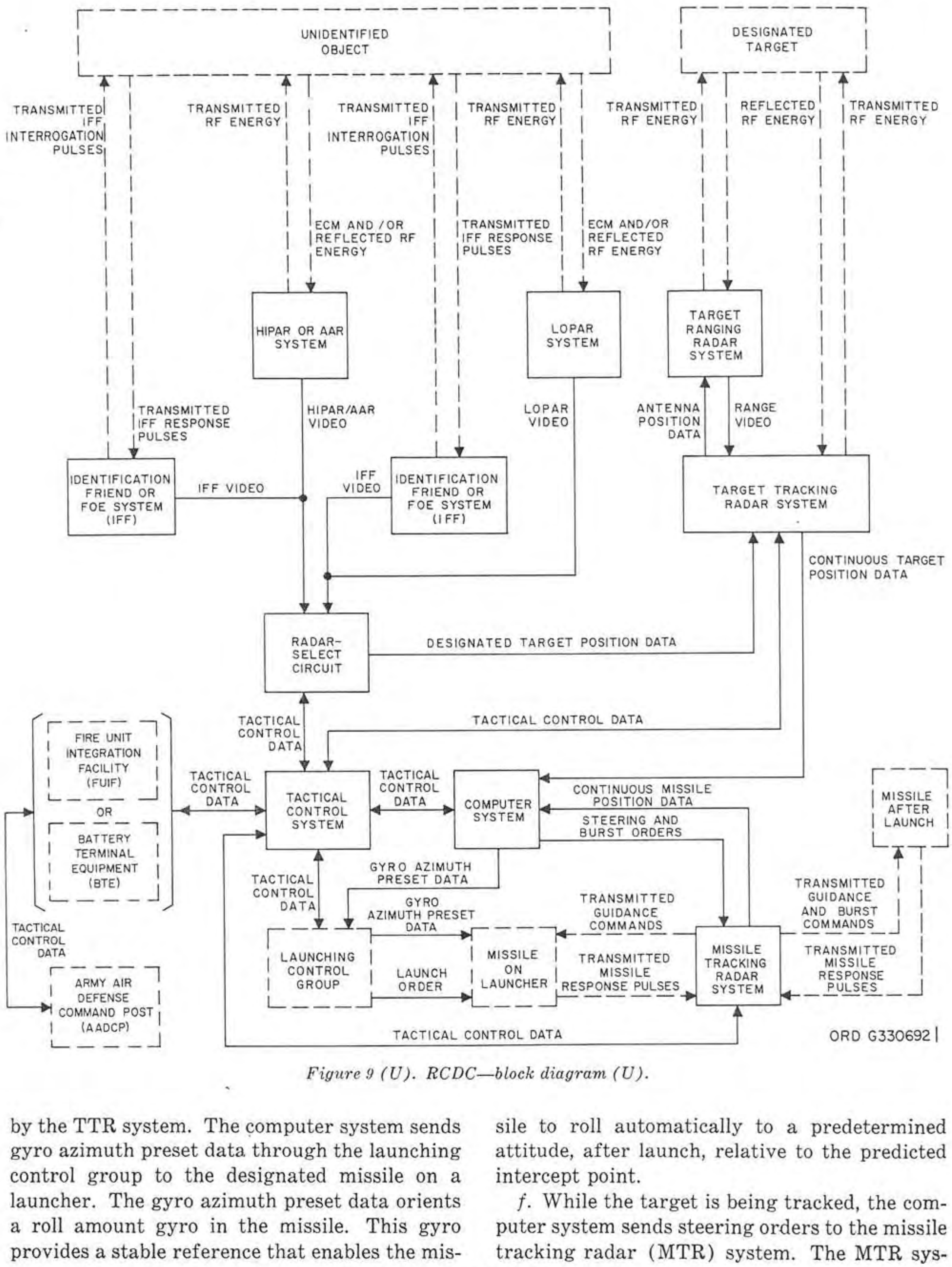


Figure 9 (U). RCDC—block diagram (U).

by the TTR system. The computer system sends gyro azimuth preset data through the launching control group to the designated missile on a launcher. The gyro azimuth preset data orients a roll amount gyro in the missile. This gyro provides a stable reference that enables the missile to roll automatically to a predetermined attitude, after launch, relative to the predicted intercept point.

f. While the target is being tracked, the computer system sends steering orders to the missile tracking radar (MTR) system. The MTR system converts the steering orders to guidance commands, consisting of coded pulses of RF energy, that are transmitted to the designated missile on a launcher. A transponder in the missile responds to the guidance commands by transmitting RF response pulses. The transmitted missile response pulses enable the MTR system to "lock on" the designated missile prior to launch and to track the missile after launch.

g. The fire command is generated manually and sent from the tactical control system to the launching control group as tactical control data, and then to the missile on the launcher as the launch order.

h. After the missile is launched and has separated from the rocket motor cluster, the missile rolls to the attitude determined before launch by the setting of the roll amount gyro and heads in the direction of the predicted intercept point. The computer system, receiving continuous target position data from the TTR system and continuous missile position data from the MTR system, determines that maneuvers are necessary to cause the missile to intercept the target and sends the appropriate steering orders to the MTR system. The MTR system converts the steering orders to guidance commands that are transmitted to the missile.

i. The missile guidance set converts the guidance commands into control surface deflections that produce the required missile maneuvers. The missile continues to transmit response pulses which enable the MTR system to track the missile and to supply continuous missile position data to the computer system.

j. When the missile is within lethal range of the target, the computer system sends a burst order to the MTR system. The MTR system transmits a burst command that detonates the missile.

k. A designated missile on a launcher may be rejected either manually or automatically. If it is determined that a designated missile is incapable of completing a successful mission for any reason, a manual missile reject signal is sent from the battery control area. An automatic missile reject signal is sent by the computer system if a designated missile does not ascend from the launcher within 5 seconds after the fire command. When a designated missile is rejected by either method, another missile must then be designated.

l. The fire command is normally sent over the tactical control circuits to the launching control group, then to the missile as the launch order. In emergencies, if the tactical control circuits are disrupted, the fire command and other tactical control data can be relayed through the voice communication system to the launching control group or to the launching section. The firing circuit is then completed by an operator at the launching control group or launching section.

m. In a surface-to-surface mission, the RCDC functions are essentially the same as in a surface-to-air mission, except for the differences described in paragraph 13.

Section II (C). PHYSICAL ARRANGEMENT

19 (U). General

a. The radar course directing central (RCDC) described in this manual is emplaced as a fixed or mobile defense installation in the Continental United States (CONUS). Two general site configurations are used. These two configurations are the "inline," with advantages of minimum radar masking, and the "T", with advantages of equipment location and real estate economy. The RCDC for the Improved NIKE–HERCULES Air Defense Guided Missile System can be emplaced either with or without the high power acquisition radar (HIPAR) or auxiliary acquisition radar (AAR). The RCDC for the NIKE–HERCULES ATBM System shall be emplaced with the HIPAR/AAR.

b. Variations of the two general fixed site configurations are described in paragraphs 20 and 20.1. A typical site configuration for a mobile installation is described in paragraph 20.2. The orientation of the RCDC with respect to the primary target line should be as specified; however, this is not a mandatory requirement. In an individual site other considerations, such as real estate availability, may make a different alinement necessary.

20 (U). Inline Configuration (Fixed Site)

The inline configuration is preferred for Improved NIKE-HERCULES and NIKE-HERCULES ATBM sites where sufficient suitable real estate is available. The inline configuration can be either a consolidated or nonconsolidated site, as described in *a* and *b* below.

Note. The key numbers shown in parentheses in *a* below refer to figure 8.

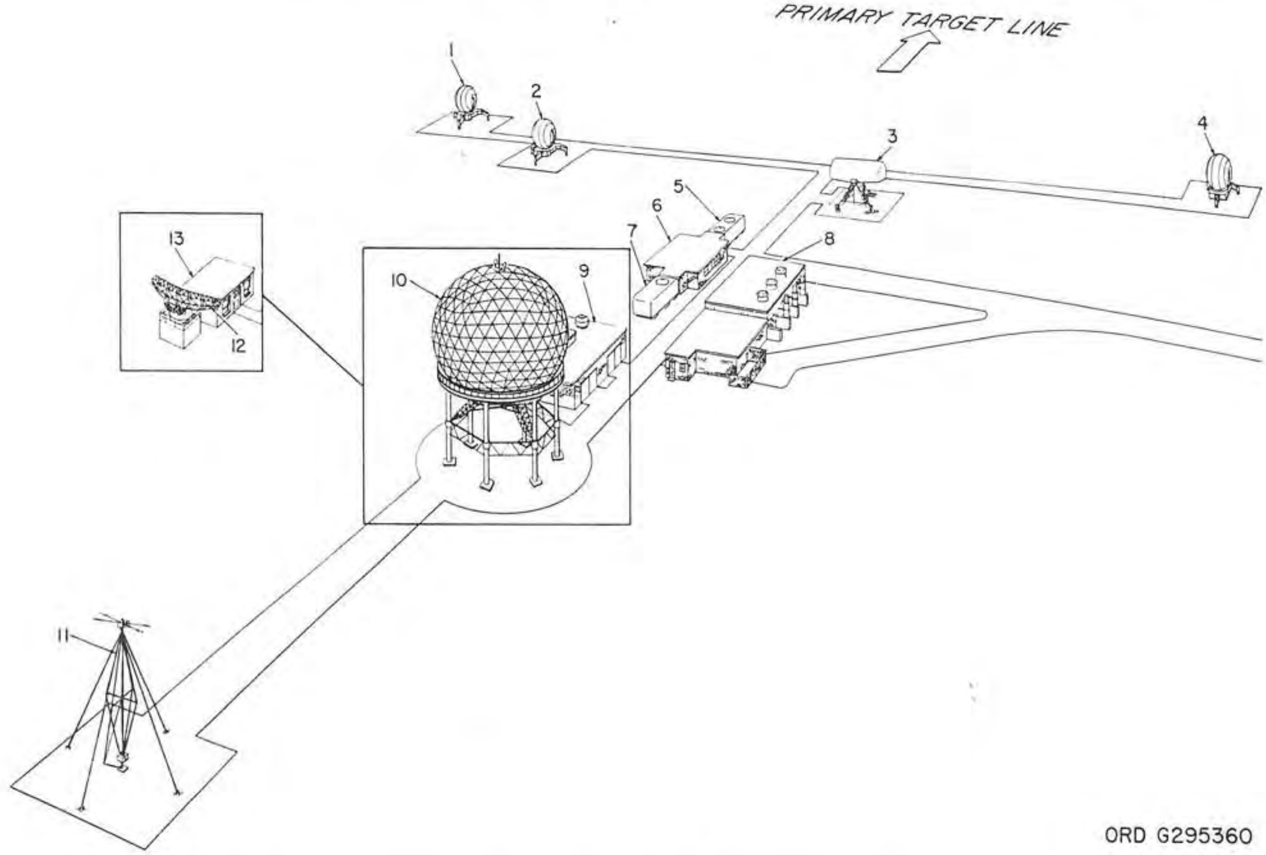
a. Consolidated Site. The consolidated inline configuration is preferred for new Improved NIKE-HERCULES and NIKE-HERCULES ATBM sites. A typical consolidated inline layout of the battery control area is shown in figure 8. The HIPAR antenna radome-support-tripod (13) or the AAR antenna (14), HIPAR building (11) or AAR shelter (15), target track antenna-receiver-transmitter group (8), target range antenna-receiver-transmitter group (7), and missile track antenna-receiver-transmitter group (6) are centered along a straight line parallel with the primary target line. The LOPAR antenna-receiver-transmitter group (5) is located to either side of the centerline, a minimum of 100 feet from the nearest track or range antenna-receiver-transmitter group (6, 7, or 8), and a minimum of 50 feet from both the trailer mounted director station (9) and the trailer mounted tracking station (10). The radar test set group (4) is located between 600 and 680 feet to either side of the centerline and within 80 feet of a line perpendicular to the centerline and midway between the target track antenna-receiver-transmitter group (8) and the missile track antenna-receiver-transmitter group (6). Unrestricted line-of-sight is maintained between the radar test set group (4) and the track and range antenna-receiver-transmitter groups (6, 7, and 8). The trailer mounted director station (9) and the trailer mounted tracking station (10) are joined to the HIPAR building (11). The power building (12) is located near the HIPAR building.

b. Nonconsolidated Site. The nonconsolidated inline configuration is employed at sites converted from NIKE-HERCULES to Improved NIKE-HERCULES or NIKE-HERCULES ATBM where relocation of equipment to an inline configuration is practical. This configuration makes use of existing NIKE-HERCULES buildings. The arrangement of the radar equipment (4, 5, 6, 7, 8, and 13, fig. 8) is the same as in the consolidated inline configuration. However, the arrangement of the trailer mounted tracking station and trailer mounted director station and the configuration of the HIPAR building are as shown in figure 10, which illustrates a nonconsolidated "T" layout. In a nonconsolidated site (either "T" or inline) the trailer mounted tracking station (5, fig. 10) and the trailer mounted director station (7, fig. 10) are attached to the existing electronic shop building (6, fig. 10) instead of to the HIPAR building (9, fig. 10).

20.1 (U). "T" Configuration (Fixed Site)

Note. The key numbers shown in parentheses in this paragraph refer to figure 10.

The "T" configuration (fig. 10) is nonconsolidated and is employed at sites converted from NIKE-HERCULES to Improved NIKE-HERCULES or NIKE-HERCULES ATBM where conversion to an inline configuration is not practical. The HIPAR antenna radome-support-tripod (10) or the AAR antenna (12), the HIPAR building (9) or AAR shelter (13), and the electronic shop building (6) are arranged on a line parallel to the primary target line. The radar test set group (11) is emplaced behind the HIPAR antenna radome-support-tripod (10), no more than 80 feet to either side, and with unrestricted line-of-sight to the target track, target range, and missile track antenna-receiver-transmitter groups (1, 2, and 4). The trailer mounted tracking station (5) and the trailer mounted director station (7), are attached to the electronic shop building (6). The power building (8) is located near the electronic shop building. The LOPAR antenna-receiver-transmitter group (3) is located at a minimum of 100 feet from the nearest track or range antenna-receiver-transmitter group (1, 2, or 4) and a minimum of 50 feet from both the trailer mounted director station (7) and the trailer mounted tracking station (5).



1—Target track antenna-receiver-transmitter group
2—Target range antenna-receiver-transmitter group
3—LOPAR antenna-receiver-transmitter group
4—Missile track antenna-receiver-transmitter group
5—Trailer mounted tracking station
6—Electronic shop building
7—Trailer mounted director station
8—Power building
9—HIPAR building
10—HIPAR antenna radome-support-tripod
11—Radar test set group
12—AAR antenna
13—AAR shelter

Figure 10 (U). Battery control area—typical nonconsolidated "T" layout (U).

20.2 (U). Mobile Installation

a. Either the inline or "T" configuration may be used for a mobile installation. The "T" configuration provides minimum equipment masking for emplacement on flat terrain. The inline configuration can be used to advantage only if the system is emplaced on sloping terrain. Figure 10.1 illustrates typical equipment locations for inline and "T" configurations of the Mobile NIKE-HERCULES ATBM System with the mobile AJI HIPAR system.

b. For both the inline and the "T" configuration, the AJI HIPAR system equipment vans are grouped around a line parallel with the primary target line. The tracking and director stations are located adjacent to each other at one end of the AJI HIPAR system power plant van. The electronic shop is located at the opposite end of the power plant van.

c. For the inline configuration, the target track antenna-receiver-transmitter group, target range antenna-receiver-transmitter group, and missile track antenna-receiver-transmitter group are centered along a straight line that is parallel with the primary target line and that extends through the center of the mobile AJI HIPAR system equipment grouping. The LOPAR antenna-receiver-transmitter group is located to one side of the center line, a minimum of 100 feet from the target range and

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missile track antenna-receiver-transmitter groups. The radar test set group is located 600 feet to one side of the center line that extends through the target range and missile track antenna-receiver-transmitter groups.

d. For the "T" configuration, the mobile AJI HIPAR system equipment vans, the tracking and director stations, and the electronic shop are located as described in *b* above. The target range, target track, and missile track antenna-receiver-transmitter groups are located on a line perpendicular to the primary target line. The LOPAR antenna-receiver-transmitter group is located a minimum of 50 feet from the tracking station and 100 feet from the missile track antenna-receiver-transmitter group. The radar test set group is emplaced behind the mobile antenna, 600 feet from the line on which the target track, target range, and missile track antenna-receiver-transmitter groups are located.

Section III (C). EQUIPMENT DESCRIPTION

21 (U). AJI HIPAR Building and Equipment (Systems 502 Through 537)

a. General. The HIPAR building (fig. 11) contains all the equipment for the AJI HIPAR system, except the HIPAR antenna and the antenna radome-support-tripod. The equipment is described in *b* through *p* below. In addition, storage space is provided in the HIPAR building for organizational repair parts, tools, and test equipment for the AJI HIPAR system. A work space is also provided for repair of equipment. In a consolidated site, the fire unit integration facility (FUIF) equipment is installed in the FUIF room (2, fig. 11) at one end of the HIPAR building. The layout of the HIPAR building in a nonconsolidated site is approximately the same as that of the consolidated site HIPAR building shown in figure 11, except that the FUIF room is omitted and the trailer mounted director station (3) and the trailer mounted tracking station (1) are not attached. In a nonconsolidated site, the FUIF equipment is installed in the electronic shop building (6, fig. 10), and the trailer mounted tracking station (5) and the trailer mounted director station (7) are joined to the electronic shop building instead of to the HIPAR building.

b. Antenna Coupler Group. The antenna coupler group consists of a system of waveguides and associated microwave components connecting the klystron amplifier (9, fig. 11) and the receiver group (16) with the HIPAR antenna (3, fig. 12). The components are the duplexer assembly (13, fig. 11), waveguide switch (12), dummy load (11), noise coupler and generator (14), and the airline support assembly (15).

c. Liquid Cooler. The liquid cooler (17) is used to remove and transfer to the atmosphere heat generated in the klystron amplifier (9) and the dummy load (11).

c.1. Pumping Unit. The pumping unit (8) circulates the glycol solution through the klystron amplifier (9) and the liquid cooler (17).

d. Control-Oscillator Group. The control-oscillator group (18) is used to provide system synchronization pulses and RF signals. During normal operation, the synchronizing pulses are distributed throughout the HIPAR system and the other radar systems of the radar course directing central as the basic timing pulses. The RF signals are used as the final RF drive for the klystron amplifier (9) and local oscillator signal for the receiver group (16). Pushbutton selection of any one of ten preset operating frequencies may be controlled from either the trailer mounted director station (3) or transmitter control-indicator (19).

e. Transmitter Control-Indicator. The transmitter control-indicator (19) is used to monitor and control the transmitter system.

f. Waveguide Pressurizer. The waveguide pressurizer (20) is used to provide a continuously controlled supply of pressurized dry air to the antenna coupler group (*b* above).

g. Induction Voltage Regulator. The induction voltage regulator (21) is used to control the level of 3-phase, primary voltage applied to the high voltage power supply (4).

h. Power Distribution Unit. The power distribution unit (22) is used to regulate and supply power to other units in the HIPAR building. It also contains a +28-volt dc power sup-

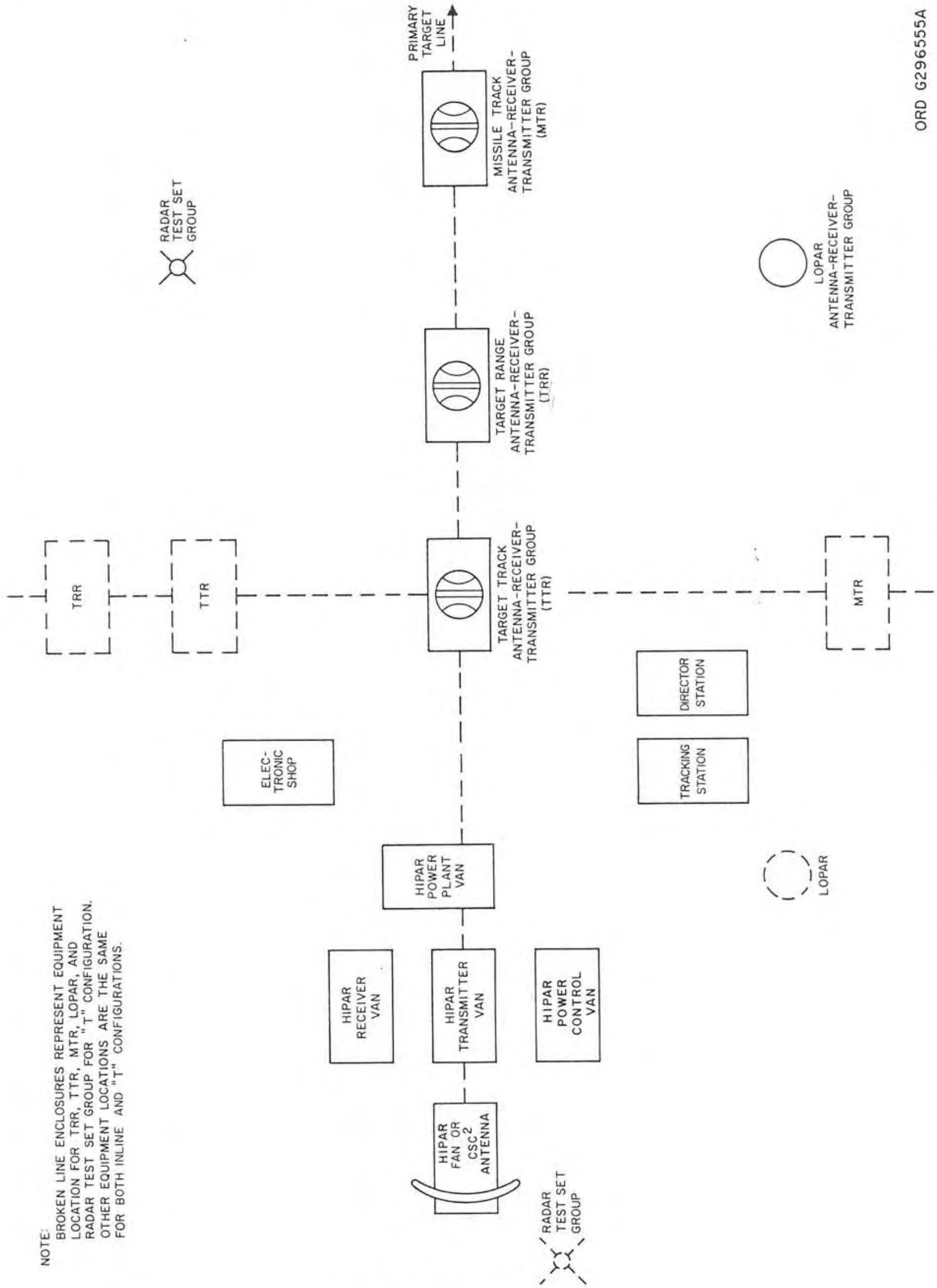

Figure 10.1 (C). Mobile installation—inline and "T" configurations (U).

ply for the low voltage control circuits of the AJI HIPAR system.

i. High Voltage Power Supply. The high voltage power supply (4) is used to supply high voltage dc to the high voltage pulse generator (5).

j. Air Conditioning Room. The air conditioning room (6) contains the heating and cooling equipment required to maintain a comfortable air temperature in the HIPAR building. In a consolidated site, the air conditioning equipment also controls the atmosphere in the trailer mounted director station (3) and trailer mounted tracking station (1) which adjoin the HIPAR building.

k. High Voltage Pulse Generator. The high voltage pulse generator (5) is used to develop the high voltage dc (modulating) drive pulse for the klystron amplifier (9).

l. Klystron Amplifier. The klystron amplifier (9) is used to develop final RF energy that is supplied by the RF harmonic filter (7) and the antenna coupler group (*b* above) to the HIPAR antenna (3, fig. 12).

m. Receiver Group. The receiver group (16, fig. 11), in conjunction with the moving target indicator group (10), is used to process target-return RF energy from the HIPAR antenna (3, fig. 12), and RF energy from the omni (1) and two auxiliary antennas (7). The four signals noted above are processed to obtain and supply video information to the HIPAR monitor PPI in the receiver group and the battery control console PPI's located in the trailer mounted director station (3, fig. 11).

n. (Deleted)

o. Moving Target Indicator Group. The moving target indicator group (10) is used to differentiate between fixed and moving targets detected by the receiver group (16).

p. Simulator Distribution Box. The simulator distribution box (23) is used for connecting the T1 trainer to the EFS HIPAR system.

21.1 (U). AJI HIPAR Building and Equipment (Systems 538 and Above)

Note. Information pertaining to AJI HIPAR systems 538 and above (except mobile systems) is contained in *a* through *o* below. Refer to paragraph 21 for information pertaining to AJI HIPAR systems 502 through 537.

a. General. The HIPAR building contains all the equipment for the AJI HIPAR system except the radar antenna support set and radome (fig. 12), the HIPAR antenna (3, fig. 12), and the liquid cooler (15, fig. 11.1.1). The building equipment is described in *b* through *o* below. Storage space for organizational repair parts, tools, and test equipment, as well as a work area for equipment repair, is provided in the building. At a consolidated site, the FUIF equipment is installed in the FUIF room (1) at one end of the HIPAR building. The trailer mounted director station (9, fig. 8) and the trailer mounted tracking station (10) are emplaced on each side of the FUIF room and connected to the HIPAR building. At a non-consolidated site, the FUIF equipment is installed in the electronic shop building (6, fig. 10.) The trailer mounted director station (7) and the trailer mounted tracking station (5) are joined to the electronic shop building (6).

b. High Voltage Power Supply. The high voltage power supply (2, fig. 11.1.1) is used to supply high voltage dc to the high voltage pulse generator (3).

1—Trailer mounted tracking station
2—FUIF room
3—Trailer mounted director station
4—High voltage power supply
5—High voltage pulse generator
6—Air conditioning room
7—RF harmonic filter
8—Pumping unit
9—Klystron amplifier
10—Moving target indicator group
11—Dummy load
12—Waveguide switch
13—Duplexer assembly
14—Noise coupler and generator
15—Airline support assembly
16—Receiver group
17—Liquid cooler
18—Control-oscillator group
19—Transmitter control-indicator
20—Waveguide pressurizer
21—Induction voltage regulator
22—Power distribution unit
23—Simulator distribution box

Figure 11 (U). HIPAR building and equipment (AJI HIPAR systems 502 through 537)—consolidated—typical cutaway view—legend (U).

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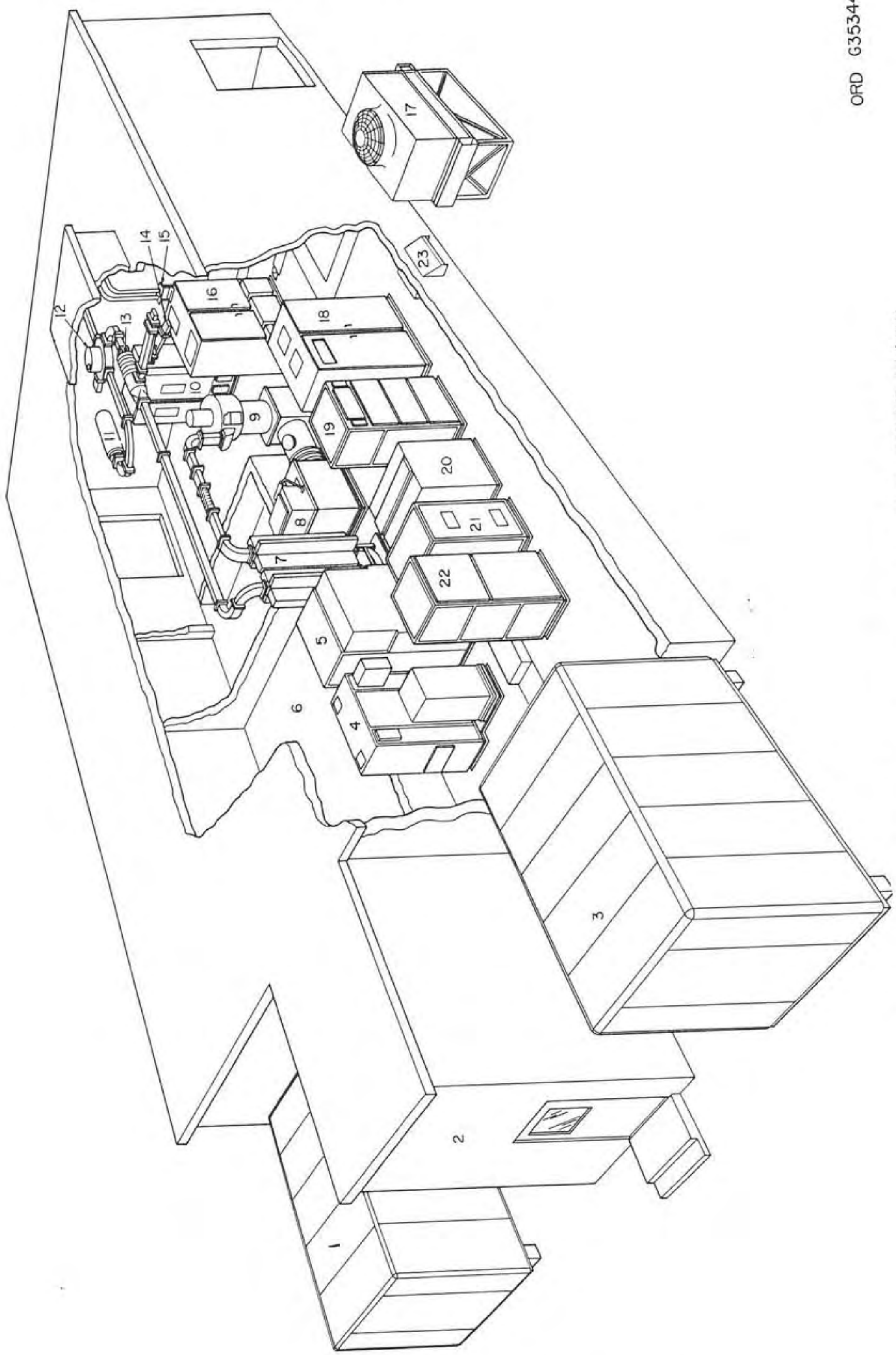

Figure 11 (U). HIPAR building and equipment (AJI HIPAR systems 502 through 537)—consolidated—typical cutaway view (U).

Figure 11.1 (Deleted)

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c. High Voltage Pulse Generator. The high voltage pulse generator (3) is used to develop the high voltage dc (modulating) drive pulse for the klystron amplifier (7).

d. RF Harmonic Filter. The RF harmonic filter (4) is used to filter undesirable harmonic frequencies from the final RF energy.

e. Antenna Coupler. The antenna coupler consists of a system of waveguides and associated microwave components connecting the klystron amplifier (7) and the receiver group (13) with the HIPAR antenna (3, fig. 12). The components of the antenna coupler are the waveguide sections (6, fig. 11.1.1), dummy load (8), noise couplers and thermal noise generators (12), duplexer assembly (11), waveguide switch (10), and the airline support assembly (11.1).

f. Klystron Amplifier. The klystron amplifier (7) is used to develop the final RF energy that is supplied by the RF harmonic filter (4) and the antenna coupler (*e* above) to the HIPAR antenna (3, fig. 12). Input to the klystron amplifier is impedance matched by the pulse transformer (5, fig. 11.1.1).

g. Moving Target Indicator Group. The moving target indicator group (9) is used to differentiate between fixed and moving targets detected by the receiver group (13).

h. Receiver Group. The receiver group (13) in conjunction with the moving target indicator group (9), is used to process target-return RF energy from the HIPAR antenna (3, fig. 12), and RF energy from the omni (1) and two auxiliary antennas (7). The four signals noted above are processed to obtain and supply video information to the HIPAR monitor PPI in the receiver group and the battery control console PPI's located in the trailer mounted director station (9, fig. 8).

i. (Deleted)

i.1. Pumping Unit. The pumping unit (14, fig. 11.1.1) circulates the glycol solution through the klystron amplifier (7), dummy load (8), and the liquid cooler (15).

j. (Deleted)

j.1. Liquid Cooler. The liquid cooler (15), located outside the HIPAR building, is used to transfer heat from the glycol solution to the atmosphere.

k. Control-Oscillator Group. The control-oscillator group (16) is used to provide system synchronization pulses and RF signals. During normal operation, the synchronizing pulses are distributed throughout the HIPAR system and the other radar systems of the radar course directing central as the basic timing pulses. The RF signals are used as the final RF drive for the klystron amplifier (7) and the local oscillator signal for the receiver group (13). Push-button selection of any one of the ten preset operating frequencies of the control-oscillator group may be controlled from either the trailer mounted director station (9, fig. 8) or the power control-indicator (17, fig. 11.1.1).

l. Power Control-Indicator. The power control-indicator (17) is used to control and to monitor the distribution of primary power for the AJI HIPAR system. Transmitter controls, monitoring facilities, and test equipment are included in the power control-indicator that also contains the waveguide pressurizer and dehydrator unit. The waveguide pressurizer and dehydrator unit are used to provide a continuously controlled supply of dry air, under pressure, to the antenna coupler (*e* above) and the RF harmonic filter (4).

m. Induction Voltage Regulator. The induction voltage regulator (18) is used to control

1—FUIF room
2—High voltage power supply
3—High voltage pulse generator
4—RF harmonic filter
5—Pulse transformer
6—Waveguide sections
7—Klystron amplifier
8—Dummy load
9—Moving target indicator group
10—Waveguide switch
11—Duplexer assembly
11.1—Airline support assembly
12—Noise coupler and thermal noise generator
13—Receiver group
14—Pumping unit
15—Liquid cooler
16—Control-oscillator group
17—Power control-indicator
18—Induction voltage regulator
19—Step-up power transformer
20—Simulator distribution box

Figure 11.1.1 (U). HIPAR building and equipment (AJI HIPAR systems 538 through 594)—cutaway view—legend (U).

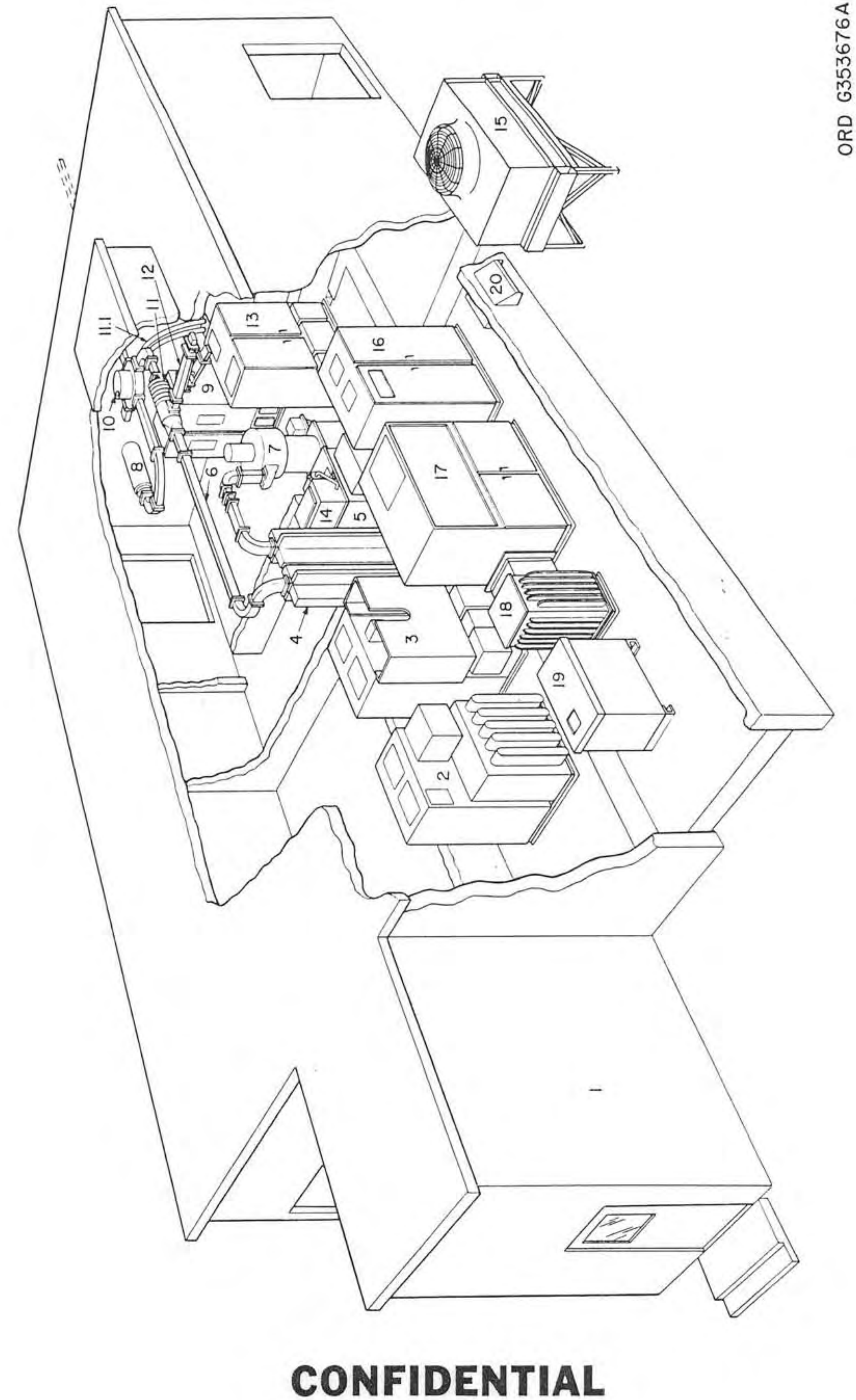

Figure 11.1.1 (U). HIPAR building and equipment (AJI HIPAR systems 538 through 594)—cutaway view (U).

the voltage level of the stepped-up primary voltage applied to the high voltage power supply (2). Operation of the induction voltage regulator (18) is controlled from the power control-indicator (17).

n. Step-up Power Transformer. The step-up power transformer (19) is used to provide stepped-up primary voltage to the induction voltage regulator (18).

o. Simulator Distribution Box. The simulator distribution box (20) is used for connecting the T1 trainer to the EFS/ATBM HIPAR system.

21.2 (U). AJI HIPAR Equipment (Systems 801 and Above)

a. General. The AJI HIPAR system (801 and above) is mounted on five semitrailers which are described in *b* through *f* below. Storage space for organizational repair parts, tools, and test equipment is provided in the vans mounted on semitrailers XM674. Space is provided in the transmitter van for SIF/IFF equipment. The trailer mounted director station and the trailer mounted tracking station are connected electrically to radar power control set AN/MJQ-7.

b. Mobile Antenna AS-1774/MPQ-43. The mobile antenna consists of the mobile FAN antenna or mobile cosecant squared (CSC^2) antenna, plus leveling and support equipment. The two antennas are discussed in paragraph 22.1.1. The leveling and support equipment maintains the mobile antenna level and rigid provided the terrain slope is not greater than 10 percent.

c. Radar Power Control Set AN/MJQ-7. The radar power control set consists of the power control van mounted on semitrailer XM674. The power control van contains the power control-indicator (para 21.1*l*), high voltage power supply (para 21.1*b*), induction voltage regulator (para 21.1*m*), and step-up power transformer (para 21.1*n*). In addition, the power control van is the distribution center for power to the AJI HIPAR system and signals to the trailer mounted director station and trailer mounted tracking station.

d. Radar Receiving Set AN/MPR-1. The radar receiving set consists of the receiver van mounted on semitrailer XM674. The receiver van contains the moving target indicator group (para 21.1*g*), control-oscillator group (para 21.1*k*), and the receiver group (para 21.1*h*).

e. Radar Transmitting Set AN/MPT-2. The radar transmitting set consists of the transmitter van mounted on semitrailer XM674. The transmitter van contains the internal antenna coupler, klystron amplifier (para 21.1*f*), and high voltage pulse generator (para 21.1*c*). The internal antenna coupler consists of a system of waveguides and associated microwave components connecting the klystron amplifier and the receiver group with the HIPAR antenna. The components of the internal antenna coupler are the waveguide sections, dummy load, noise couplers and thermal noise generators, duplexer assembly, waveguide switch, and RF harmonic filter subassembly (para 21.1*d*).

f. Electric Power Plant. The electric power plant consists of two diesel-engine generators, a motor-generator, a power switchboard, and a 90-kilowatt resistive load bank mounted on semitrailer XM674. The two engine generators provide primary 60-cycle power for the AJI HIPAR system. The motor-generator provides 400-cycle power to the RCDC. The power switchboard contains facilities for selecting a power source (commercial or generator) and commercial power monitoring equipment.

Note. There are two configurations of the HIPAR antenna, called the HIPAR CSC^2 antenna and the HIPAR FAN antenna. These antennas are used interchangeably with systems 538 through 594, and either antenna may be used with systems 502 through 537. However, the HIPAR CSC^2 antenna is normally used with systems 502 through 537. The HIPAR CSC^2 antenna is discussed in paragraph 22, and the differences between this antenna and the HIPAR FAN antenna is noted in paragraph 22.1.

22 (U). HIPAR Antenna Radome-Support-Tripod and HIPAR CSC^2 Antenna

a. HIPAR Antenna Radome-Support-Tripod. The HIPAR antenna radome-support-tripod (2, 4, and 5, fig. 12) supports and houses the HIPAR CSC^2 antenna. Major components of the HIPAR antenna radome-support-tripod are the radome (2) which encloses the HIPAR CSC^2 antenna, and the antenna tripod (5) and radome support (4) which support the HIPAR CSC^2 antenna. The antenna radome-support-tripod may be emplaced either with or without the radome support extension (6), depending upon the individual site requirements.

b. CSC² Omni Antenna. The CSC² omni antenna (1) is used to receive and supply a sample of the target-returned energy through the antenna coupler.

c. HIPAR CSC² Antenna. The HIPAR CSC² antenna (3) is used to transmit RF energy supplied from the antenna coupler. In addition, the HIPAR CSC² antenna receives and supplies target-return RF energy through the antenna coupler to the receiver group (16, fig. 11).

d. Auxiliary Antennas. The two auxiliary antennas (7, fig. 12) are unidirectional, fixed-type receiving antennas used to intercept interfering signals in the side lobes of the HIPAR CSC² antenna. Each antenna is mounted on a mast that is fixed to the back of the HIPAR CSC² antenna.

22.1 (U). HIPAR Antenna Radome-Support-Tripod and HIPAR FAN Antenna

a. HIPAR Antenna Radome-Support-Tripod and Auxiliary Antennas. The radome-support-tripod and the auxiliary antennas are identical in the cosecant squared and fan configurations. Refer to paragraph 22 for the description.

b. FAN Omni Antenna. The reflector of the FAN omni antenna is physically reversed from the reflector of the CSC² omni antenna (1, fig. 12), but the two antennas function in an identical manner. Refer to paragraph 22 for the description.

c. HIPAR FAN Antenna. The HIPAR FAN antenna reflector is reduced in height from the HIPAR CSC² antenna reflector. This reduction in reflector height provides a better high altitude coverage, but the fan antenna is more susceptible to high altitude jamming. With these exceptions, the HIPAR FAN antenna is physically and functionally similar to the HIPAR CSC² antenna. Refer to paragraph 22 for the description.

22.1.1 (U). Mobile Antenna, Leveling and Support Equipment, Omni Antenna, and Auxiliary Antennas

a. Mobile FAN Antenna. The mobile FAN antenna is functionally the same as the HIPAR FAN antenna discussed in paragraph 22.1*c*. It differs physically in that it consists of eight removable reflector sections and a fixed center section that can be folded down for march orders. The mobile FAN antenna is mounted on semitrailer XM674 and is a self-contained mobile unit.

b. Mobile CSC² Antenna. When a lower altitude, long range antenna coverage pattern is required, the mobile FAN antenna may be converted into the mobile CSC² antenna. This is accomplished through the installation of the mobile CSC² antenna conversion kit which consists of five reflector panels, the mobile CSC² feedhorn, and the mobile CSC² omni antenna.

c. Leveling and Support Equipment. The mobile antenna is equipped with two outrigger and jack screw assemblies to maintain stability and level on terrain up to a ten percent slope. The support equipment consists of four leveling gears mounted on semitrailer XM674 and the mobile antenna pedestal. The mobile antenna pedestal contains the pedestal and reflector raising and lowering mechanisms.

d. Mobile FAN Omni Antenna and Mobile CSC² Omni Antenna. Target returns received by the omni antenna are compared with those received by the main antenna to determine the azimuth position of a jamming source. Physically, the mobile FAN or CSC² omni antenna is mounted on a mast at the top of the main antenna reflector. The mobile FAN or CSC² omni antenna element is covered with a weatherproof Fiberglas radome.

e. Auxiliary Antennas. The two auxiliary antennas are unidirectional, fixed-type receiving antennas used to intercept interfering signals in the side lobes of the mobile antenna (FAN or CSC²). Each antenna is fixed to the back of the mobile antenna (FAN or CSC²).

22.2 (U). Auxiliary Acquisition Radar

The AAR may be installed at selected sites for use with the Improved NIKE-HERCULES System. The AAR equipment is described in *a* and *b* below.

a. Antenna Group. The antenna group consists of the antenna (1, fig. 11.2), the antenna pedestal (6), a power cable (4), and the waveguide section (2) which connect the antenna pedestal to the duplexer in the AAR shelter (3). The antenna and antenna pedestal are mounted on a reinforced concrete base (5).