

PA-AEE-664



HIGH FREQUENCY RADIO COMMUNICATIONS ASSESSMENT
FOR THE
SUDAN PLANT PROTECTION DIVISION

65239

This High Frequency Radio communication assessment was prepared for the Office of Foreign Disaster Assistance, U.S. Agency for International Development under contract FDA-0000-0-00-8041-00. Comments or questions should be addressed to:

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HF Radio Communications Assessment

SUDAN PLANT PROTECTION DIVISION

Traveler: Donald R. Smith

Days of travel: 25 Aug - 1 Sep 1988

Country visited: Sudan

PURPOSE:

To design a radio system for the Plant Protection Division of the Government of Sudan. Specifically to:

- assess the immediate and short term communications equipment needs of the Plant Protection Division (PPD) for desert locust and grasshopper control operations.

- identify and provide written specifications for equipment including installation specifications.

- review and assess local capabilities for installation and maintenance of radio communications equipment.

- provide short training guides for users of the communications equipment.

ITINERARY:

APPENDICES:

1. Points of Contact
2. Site Visit Reports
3. Concept of Operations and Network Architecture
4. Propagation Predictions and Frequency Requirements
5. Equipment Recommendations
6. Installation Procedures
7. Users Training Guide
8. Air-Ground Operations
9. USAID Field Communications

25 - 26 Aug 88 Khartoum, Sudan - Received in country briefing, obtained status of desert locust problems, and discussed PPD communications shortfalls. Visited the PPD and received a briefing on the PPD organization. Reviewed radio equipment installations, discussed the status of existing radio assets, and observed radio procedures.

28 - 29 Aug 38 Khartoum, Sudan - Met with donor representatives and reviewed maintenance facilities available. Discussed installation capabilities, and coordinated communications procedures with USAID radio personnel.

30 Aug 88 El Obeid, Sudan - Met with PPD officials, reviewed radio and antenna installations, and discussed communications problems.

31 Aug 38 El Fashir, Sudan - Met with PPD and UNDP personnel to discuss area radio problems. Reviewed available radio equipment, and coordinated communications procedures.

1 Sep 88 Khartoum, Sudan - Briefed USAID mission personnel on El Obeid and El Fashir status and discussed integration of communications capabilities with agricultural spray operations. Prepared draft summary of recommendations for immediate action by mission personnel.

Site Visit Reports: See Appendix 2

Lessons Learned: N/A

Conclusions:

1. The most effective means of communication available to support the PPD desert locust and grasshopper control operations is high frequency (HF) radio. Requirements are based on many dispersed operational locations; the peculiar characteristics of each PPD district, the lack of other existing communications, and the general topography of Sudan.

2. While the PPD has an established HF network coverage is limited. Operational capability exists only between the headquarters, district offices, and a few mobile stations. Many radios are inoperative and awaiting maintenance. Primary radios are ICOM-735 Amateur HF SSB radios.

3. There are insufficient mobile radios available for PPD field survey vehicles. This limits effective use of available resources for control of the desert locust and grasshopper

survey and treatment.

4. The existing HF communications has developed with no concept of operations or defined network architecture to integrate and effectively use the existing communications assets.

5. Without a concept of operations, or defined network architecture, attempts by various donor countries to provide communications equipment have not been fully effective. Some equipment provided is unsuitable for the type operations conducted and further the capabilities of the PPD.

6. The PPD frequencies assigned to support the operational requirements are extremely limited. Four frequencies are available but all are within a one MHz range. This limits the reliability of the net and produces congestion and confusion.

7. Again, except for the military, there is little mobile radio installation and maintenance infra-structure to support the PPD communications net. The few mobile radios available were installed by PPD technicians but none were available to verify installation procedures.

8. As noted in other countries, restrictions on the importation of transmitting equipment and contracting with outside companies for turnkey communications installations has hindered the development of an adequate technological experience base in all types of mobile radio communications.

9. Little emphasis is being placed on user preventive maintenance inspections and services to equipment. With the equipment currently in use, this contributes significantly to the degradation of the communications capability and the shortened life expectancy of the equipment.

RECOMMENDATIONS:

1. Assist the PPD in locating and obtaining immediate repair of inoperative radio assets. There is a PYE Telecommunications Ltd representative in Khartoum and other sources may also be available for immediate repair services.

2. Establish and disseminate a concept of operations and network architecture to define the communications requirements of the PPD. Based on discussions with PPD officials, technicians, and field survey personnel a proposed concept of operations and network architecture is furnished as Appendix 3.

3. Additional HF radios and ancillary equipment are required to provide the essential communications capability of the PPD. Equipment specifications furnished in Appendix 5 reflect the technical characteristics necessary to support the concept of operations contained in Appendix 3.

4. The PPD should request frequencies from the Ministry of Posts and Telecommunications (OPT) to support the network architecture. Typical propagation predictions are furnished and the required frequency ranges provided. These are included in Appendix 4.

5. Commercial installation practice for mobile radios is unsuitable for PPD mobile installations. Vehicle use is primarily in off-road 4WD conditions. The shocks associated with this type of operation are considerably higher than considered in normal installations. Recommend installation of shock/vibration isolator mounts for all mobile equipment installations.

6. For vehicles with mounted agricultural spray equipment. Mount radio components inside the vehicle cab with the antenna mount and connections mounted as high on the cab as possible. Pesticides used are extremely corrosive and any equipment exposed to these sprays must be thoroughly cleaned as soon as possible after exposure.

7. Assist in the reproduction and distribution of the installation, maintenance, and radio operating procedures furnished in Appendices 6 and 7.

FOLLOWUP-ACTION ITEMS:

1. Deficiencies with the current radio installations were noted during the site visits. Immediate action must be taken to correct these deficiencies.

2. Firmly identify warranty periods and locations for warranty maintenance. Confusion on when the warranty periods start and stop and the provisions for obtaining warranty maintenance could result in unnecessary costs during the initial installation and operating period.

APPENDIX 1

POINTS OF CONTACT

H. Peters Strong	General Development Officer, USAID
James Bleidner	Agricultural Officer, USAID
Charles Reed	ADO Desert Locust Project
Hassan Abbas	Director, PPD
Abdalla Aballa	Chief, Locust Control, PPD
Ronald Libby	Logistician, USFS
Lynn Thomas	Logistician, USFS
Robert Sidell	Operations Officer, UNDP El Fashir

APPENDIX 2

SITE VISITS

Khartoum - PPD Headquarters

Fixed Base - The antennas in use are dipole antennas (2) installed approximately 15 meters high, suspended from pipe masts fastened to the PPD building. Antennas orientation is roughly E - W and SW - NE. Both transmission lines terminated in a knife switch in the second floor radio room. Commercial power had been out for one week and all operation was from generator power. The radio being used was an ICOM - 735 Amateur HF radio using an ICOM power supply. The radio operates on 13.8 VDC. There were several inoperative radios at this location and three new ICOM - 735 radios requiring modification for full band coverage.

Mobile - There was no mobile radio available at this location.

Recommendations:

Replace the dipole antennas with a B & W broadband dipole to obtain required coverage of assigned frequencies. Replace the knife switch on the antennas coax with a proper coaxial switch. Have inoperative mobile radios repaired and installed as soon as possible. Complete modifications on ICOM - 735 radios and install at sub-district offices.

El Obeid - PPD District Office

Fixed Base - The antenna used was a single dipole installed at approximately 10 meters on pipe mast sections. The radio used was an ICOM - 735 using an ICOM power supply.

Mobile - There was no mobile available at this location.

Recommendations:

Replace the antenna with a B & W broadband dipole capable of using all assigned PPD frequencies. Replace the coax connection to the antenna with a proper connector. Secure the antenna to the masts with appropriate cable, insulators, and clamps. Alternative power sources should be available to provide consistent power for the radio.

El Fashir - PPD District Office

Fixed Base - The antenna used was a single frequency dipole antenna installed at approximately 10 meters on pipe mast sections. The base station radio was an ICOM - 735 using an ICOM power supply.

Mobile - There was no mobile available at this location.

Recommendations:

Replace the antenna with a B & W broadband antenna capable of using all assigned PPD frequencies. Make sure the antenna is secured to the masts with appropriate cable, insulators, and clamps. An alternative power source should be available to provide uninterrupted power to the radio.

El Fashir - UNDP Camp

Fixed Base - There are multiple HF radios and antennas available at this location. Antennas consist of a B & W Broadband dipole, individual single frequency dipoles, and a log-periodic 6.5 - 30 MHz. Radios consisted of Motorola Micom - S, Kenwood TS-940S, and Motorola rack mounted transmitter and receiver for radio teletype operations. Generators provide backup power for all radios.

Mobile - Several mobile radios were noted during this visit. A Motorola Micom - S and a Harris RF Products tactical HF radio. Both radios were equipped with automatic antenna tuners.

Recommendations: None

APPENDIX 3

CONCEPT OF OPERATIONS

The lack of a concept of operations inhibits development of a viable, integrated network architecture. The architecture must define communications requirements, levels of control and coordination, operating elements, and typical locations . This lack of architecture correlates directly with the ability to respond in the most efficient manner making the most effective use of plant protection assets.

Discussion with Plant Protection Division personnel, survey technicians, aeronautical spray technicians, and other parties involved in desert locust and grasshopper control operations identified: types of information, time periods required, methods of operation, and equipment limitations during operations.

As a result of visits and discussions the following proposed concept of operations and network architecture is submitted for consideration.

CONCEPT OF OPERATIONS

PLANT PROTECTION DIVISION HF COMMUNICATIONS NETWORK

I. PURPOSE:

The Plant Protection Division (PPD) HF radio network is designed to identify essential control and coordination communications requirements between PPD headquarters, PPD District headquarters, dispersed field survey and treatment elements.

The Plant Protection Divisions' responsibilities are numerous. Among these are; monitoring potential crop hazards, coordinating and controlling personnel, equipment, and supplies in response to threats to crop production. The lack of an extensive communications infra-structure within the country's agricultural areas requires an effective, efficient, and timely communications network. The topography of Sudan and the distances between operating elements eliminates virtually all communications modes except high frequency (HF) radio.

II. FUNCTIONAL ORGANIZATION:

A. The Plant Protection Division headquarters is located in Khartoum. Communications is required between the PPD hqs and the district offices located the Darfur, Kurdufan, Northern and Eastern districts. Types of information to be discussed are; operational coordinations, scheduling, status of supplies and equipment, and control of assets necessary to meet operational requirements.

B. Within the districts the PPD offices must have a communications capability with dispersed field survey teams, treatment teams, and agricultural support aircraft. Timely reporting of types of pests, stages of development, location of infestations, and movements are essential to plan and coordinate treatment operations.

C. Field operating elements, survey teams, aircraft, aircraft support, and observation and marking teams, require inter-team communications. These communications provide positioning information, request maintenance assistance, coordinate spraying paths, and report coverage effectiveness.

D. Normal periods of operation are 6:00 AM to 6:00 PM daily.

III. EQUIPMENT REQUIREMENTS:

A. PPD Hqs/District Offices

Facilities require HF radios capable of communication with all dispersed locations and should have scanning capability to monitor assigned frequencies. To provide for interchangeability and eliminate dependence on unreliable power all radios must operate on 13.8 VDC. Stations must have antennas capable of using all assigned PPD frequencies. Fixed stations will be equipped with batteries for operation capable of a minimum 4 hours operating capacity. Alternative power sources with automatic battery chargers should be provided to maintain battery charging capacity.

B. Portable Base Stations

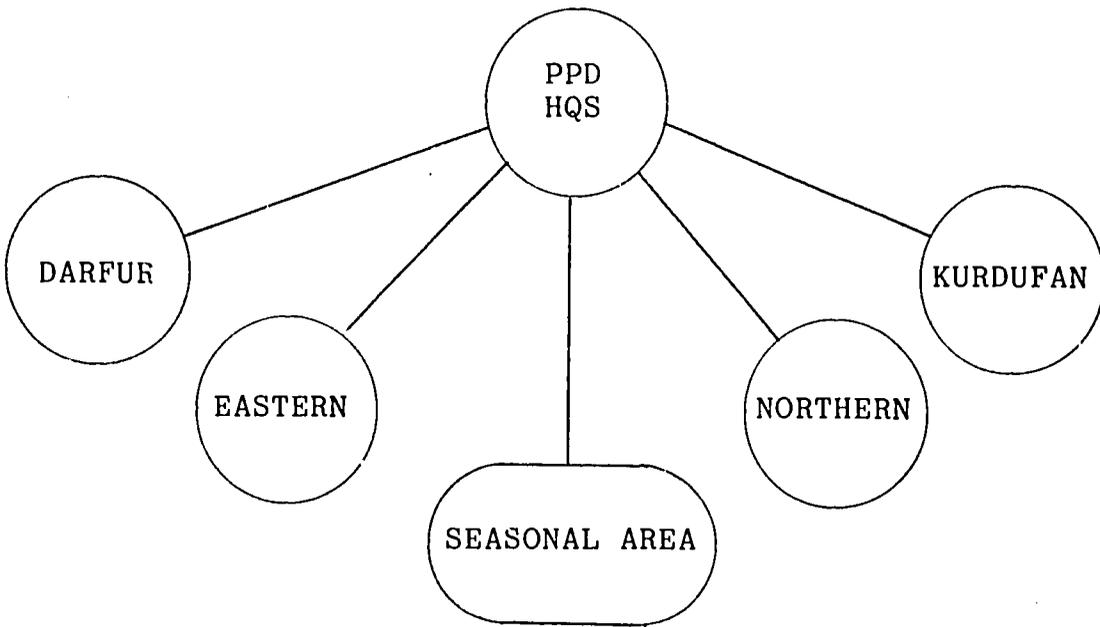
Portable base station equipment is required for temporary operation in the seasonal breeding areas and to provide increased communications capability during periods of peak operation. HF radio equipment must be capable of operating on all assigned PPD frequencies. Equipment must be capable of operation on 13.8 VDC to minimize reliance on commercial power sources. Light weight broad band antennas with push up type masts will be used provide the required frequency coverage. Dry charge 100 ampere hour capacity batteries will be used to provide adequate operation capability and minimize battery handling and maintenance problems. Alternative power sources with automatic battery chargers should be provided to maintain battery charging capacity.

C. Mobile Installations

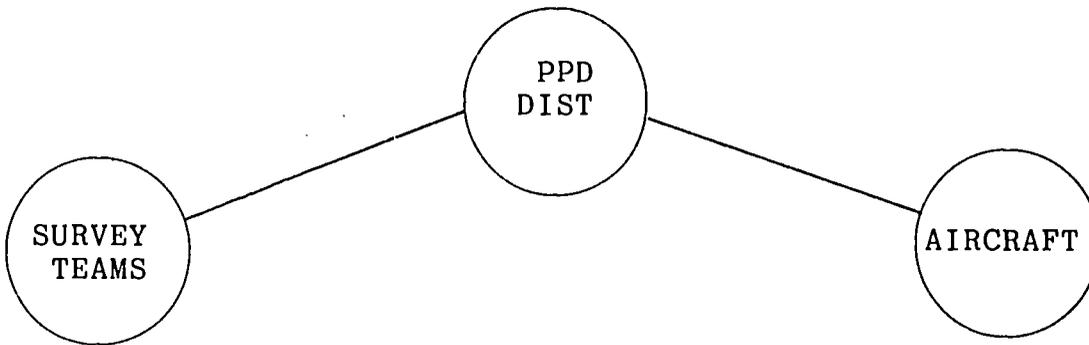
Mobile equipment must be fully capable of operating on assigned PPD frequencies while in motion or stationary. Due to inherent antenna limitations, automatic antenna couplers with an capable of providing matching for all frequencies between 3 and 18 MHz must be provided. Equipment must be mounted in a manner to provide shock/vibration isolation during extensive off road operations. Radio equipped vehicles must have appropriate radio frequency interference suppression devices installed. All equipment will operate on 13.8 VDC with the exception of aircraft mounted/installed equipment.

IV. NET/SUB-NET STRUCTURES

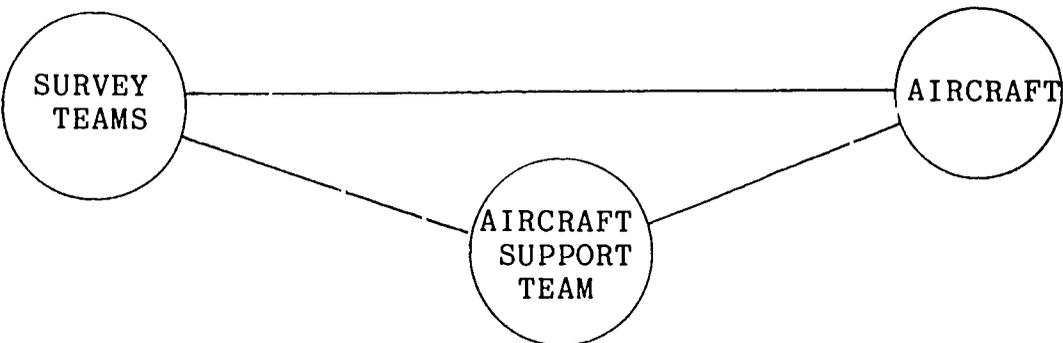
A. PPD Net



B. Department Sub-Net



C. Air Ground Coordination Net



APPENDIX 4

PROPAGATION PREDICTIONS AND FREQUENCY REQUIREMENTS

The PPD currently has four frequencies for country wide and district operational use. The frequencies as shown below are all within a one MHZ range which is insufficient to obtain necessary reliabilities. Additionally, interference within the net can be expected to make the net unusable when full operational capability is attained. Additional frequencies are required to provide adequate communications service in meeting PPD requirements.

Frequency Assignments: 4985 KHz 5430 KHz 5470 KHz 5935 KHz

Typical propagation predictions were prepared to identify necessary frequency ranges for PPD operations. These predictions along with the proposed concept of operations define the requirements.

Frequency requirements should be submitted through appropriate ministerial channels to the OPT for necessary action. The following technical information is furnished to assist in frequency assignment action:

For the PPD Headquarters/District Net:

User: Plant Protection Division

Emission: 3K00J3E Power: 400 Watts

Station class: FX

1 Frequency in band 5060-5480 KHz

1 Frequency in band 7300-8100 KHz

1 Frequency in band 10150-11275 KHz

Operating Locations are:

- Khartoum PPD Hqs
- Kurdufan District Office
- Darfur District Office
- Northern District Office
- Eastern District Office

For the District Operations Sub-Net:

User: Plant Protection Division

Emission: 3K00J3E Power: 400 Watts

Station class: FX/MO

1 Frequency in band 4750-4995 KHz

1 Frequency in band 6765-7000 KHz

1 Frequency in band 9040-9500 KHz

Operating Locations: Country wide

For the Air/Ground Support Sub-Net:

User: Plant Protection Division

Emission: 3K00J3E Power: 400 Watts

Station class: MO

1 Frequency in band 5680-5730 KHz

1 Frequency in band 8965-9040 KHz

Operating Locations: Country wide

User: Plant Protection Division

Emission 6K00A3E Power: 10 Watts

Station class: MO

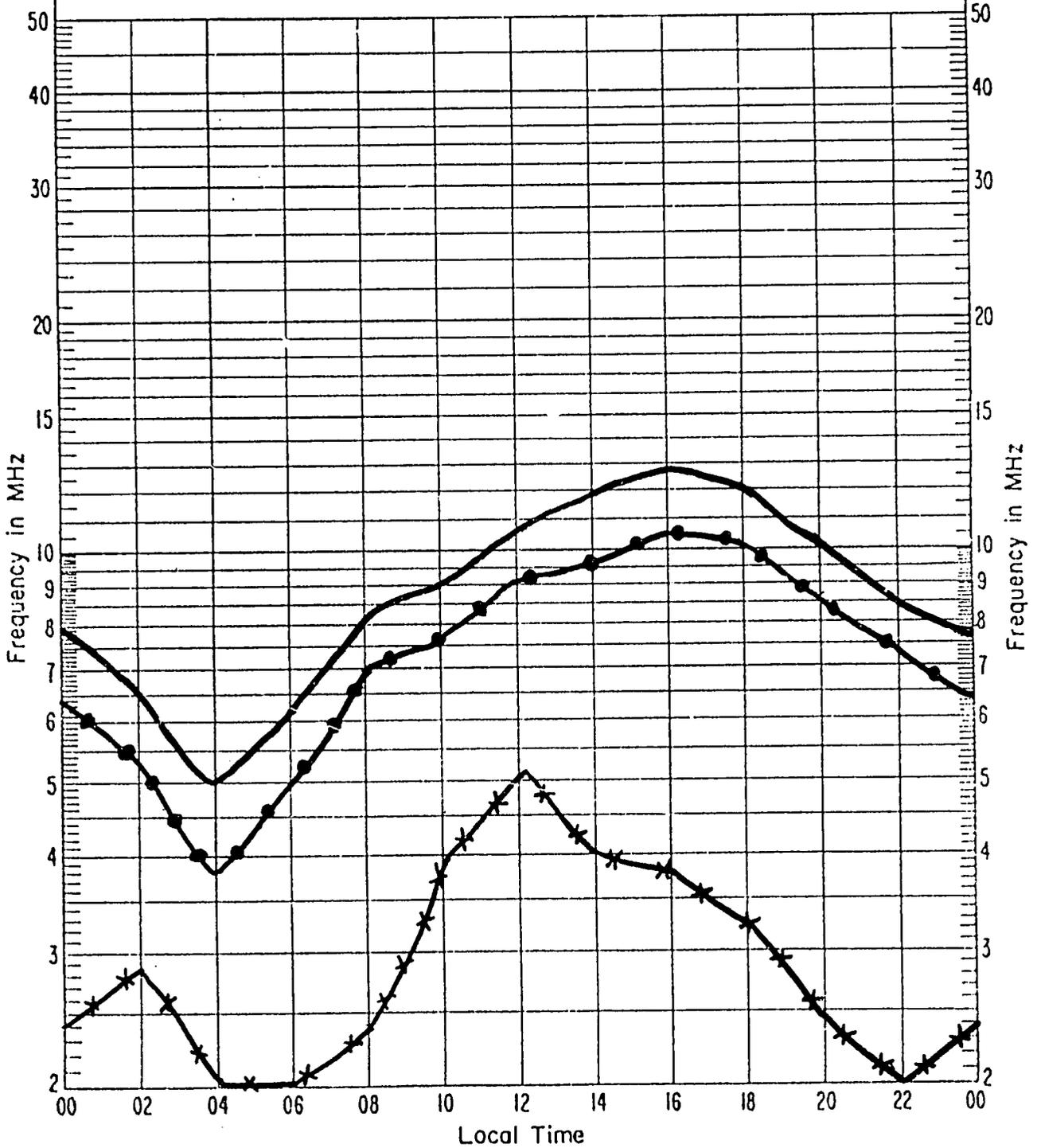
1 Frequency in band 132-133 MHz

Operating Locations: Country wide

Separate nets/sub-nets are required to permit multiple operations simultaneously within the country and still provide reliable communications.

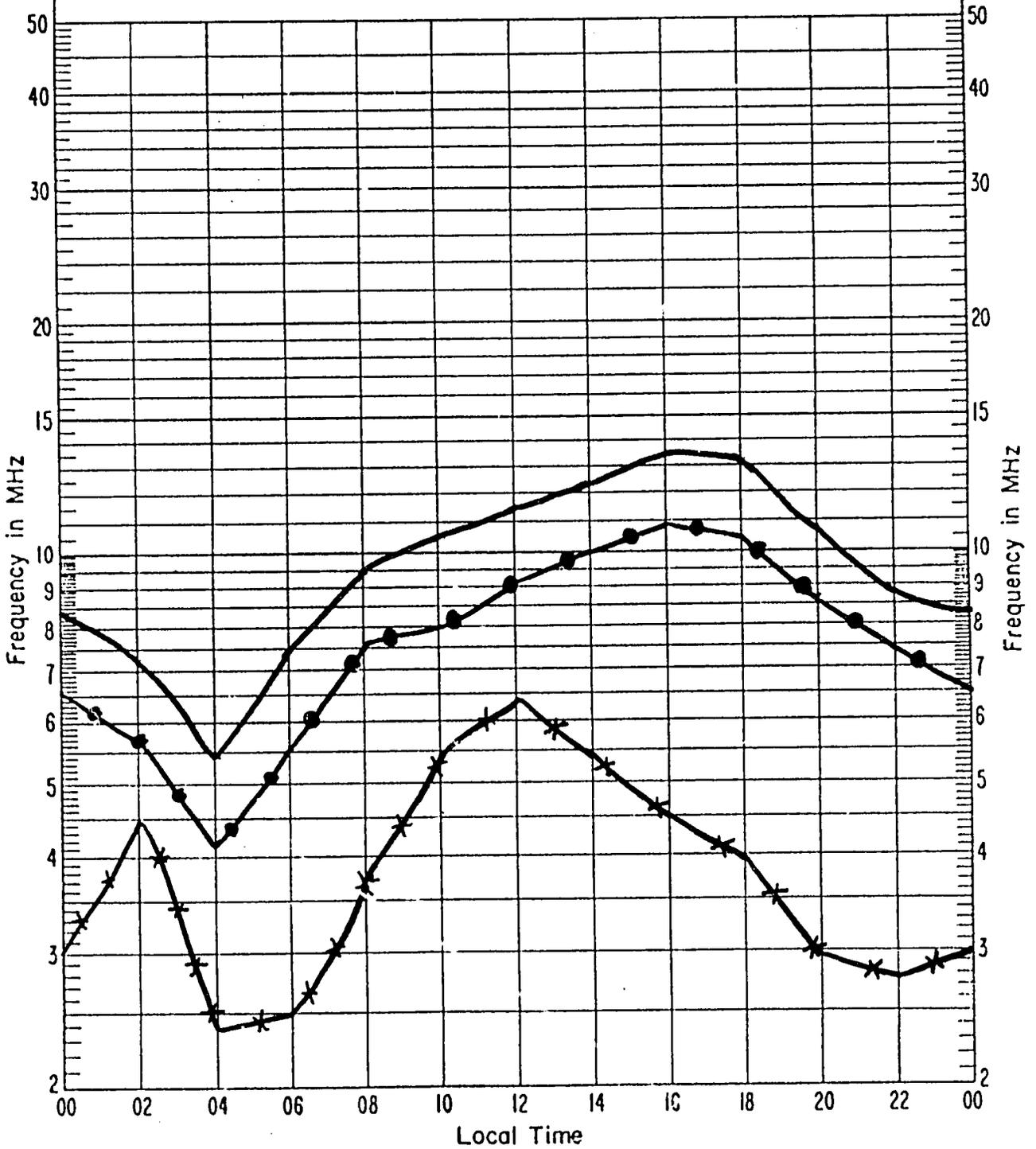
160 KM
SSN 80
DIPOLE 33'
100 WATTS
3K00J3E
0W

MUF ———
FOT ●—●—
LUF ×—×—



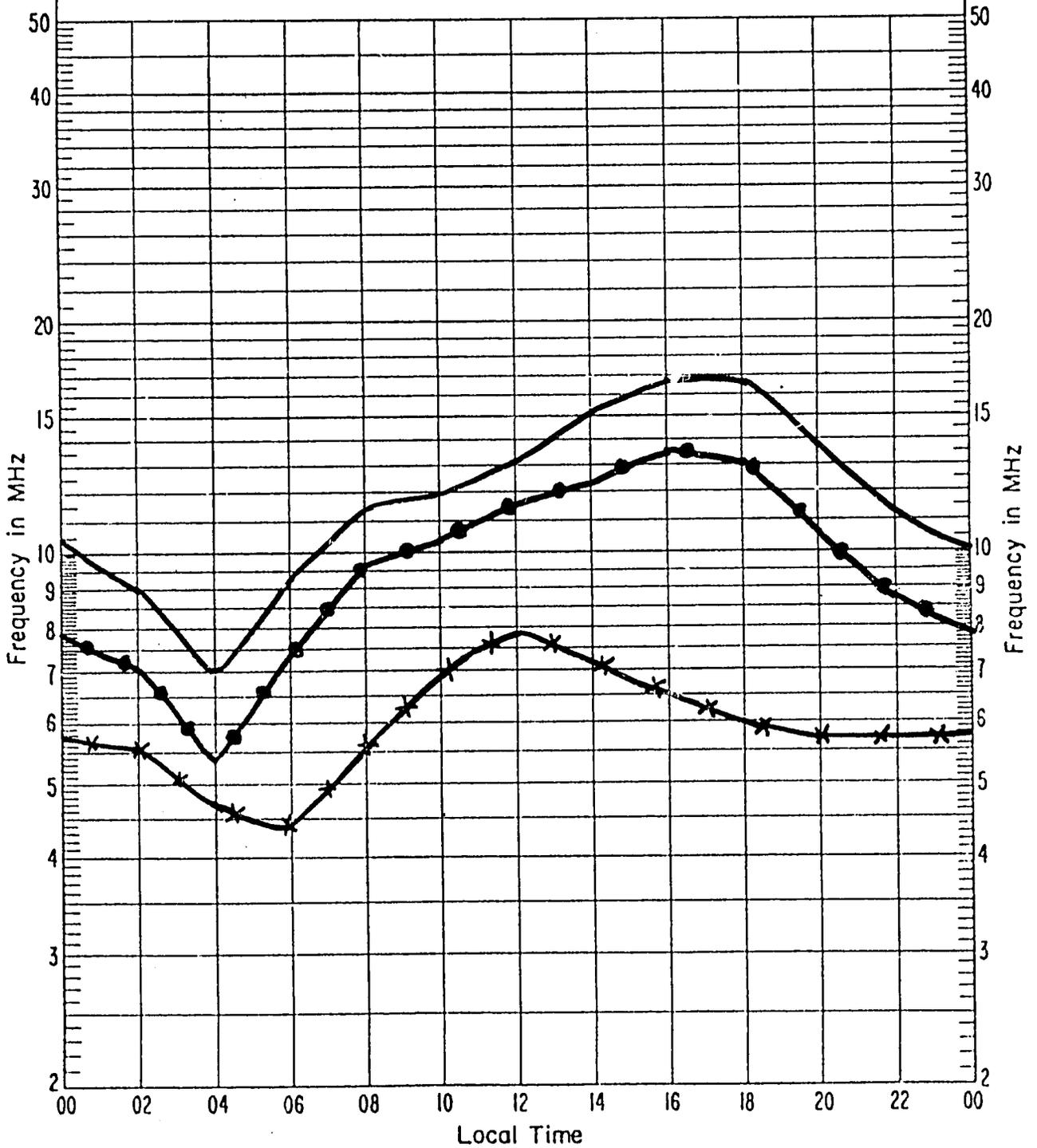
400 KM
SSN 80
DIPOLE 33'
100 WATTS
3K00J3E
OW

MUF ———
FOT ●●●
LUF * * *



800 KM
SSN 80
DIPOLE 33'
100 WATTS
3K00J3E
0W

MUF —
FOT ●●
LUF * *



APPENDIX 5

EQUIPMENT RECOMMENDATIONS

The following additional communications equipment recommendations are made to support the Plant Protection Division HF network. These recommendations are made to:

1. provide minimum essential capability
2. standardize and permit interchangeability with existing equipment
3. standardize installation and maintenance procedures
4. standardize operator training

RADIO:

Mobile Applications:

Motorola MICOM-S, Model D80JMA1N00AK, 2 - 13 MHz tuning range in 100 Hz increments 125 watts PEP output, 13.8 VDC operating voltage or equivalent radio

Noise Blanker Option S135

USB/LSB Option S122

Mobile Mounting Tray TRN4047

Fixed/Portable Base Applications:

Motorola MICOM-S, Model D80JMA1N00AK, 2 - 13 MHz tuning range in 100 Hz increments 125 watts PEP output, 13.8 VDC operating voltage or equivalent radio

Noise Blanker Option S135

USB/LSB Option S122

Mobile Mounting Tray TRN4047

ANCILLARY ITEMS:

Antenna Tuner, mobile F2260

Antenna Mount, heavy duty, stainless steel

Motorola mobile HF whip antenna

Programming Board TRN 4963A

B&W 370-15 Broadband Dipole Base Station Antenna

Coaxial lightning arrestors

Vibration/shock isolation mounts

APPENDIX 6

INSTALLATION PROCEDURES

Several installation procedures have been developed to assist in the establishment of the PPD HF radio net. Reduce in size to 5 X 7 inches. Laminate and distribute to all personnel involved with the installation and maintenance of the PPD HF radios.

- 1 - Fixed Station Battery Installation
- 2 - Fixed Station Antenna Installation
- 3 - Mobile Radio Installation Tips
- 4 - Modification Instructions, ICOM-735 Radio

FIXED STATION BATTERY INSTALLATION

1. Batteries for fixed operations must be 100 AH capacity.
2. Locate batteries in a well ventilated area.
3. Fasten battery chargers securely to a wall near the battery location.
4. Wiring between the battery charger and the battery should be 10 gauge or larger.
5. Post warning signs at each battery location.

" NO SMOKING, MATCHES, OPEN FLAME, OR SPARK

PRODUCING DEVICES WITHIN 10 METERS"

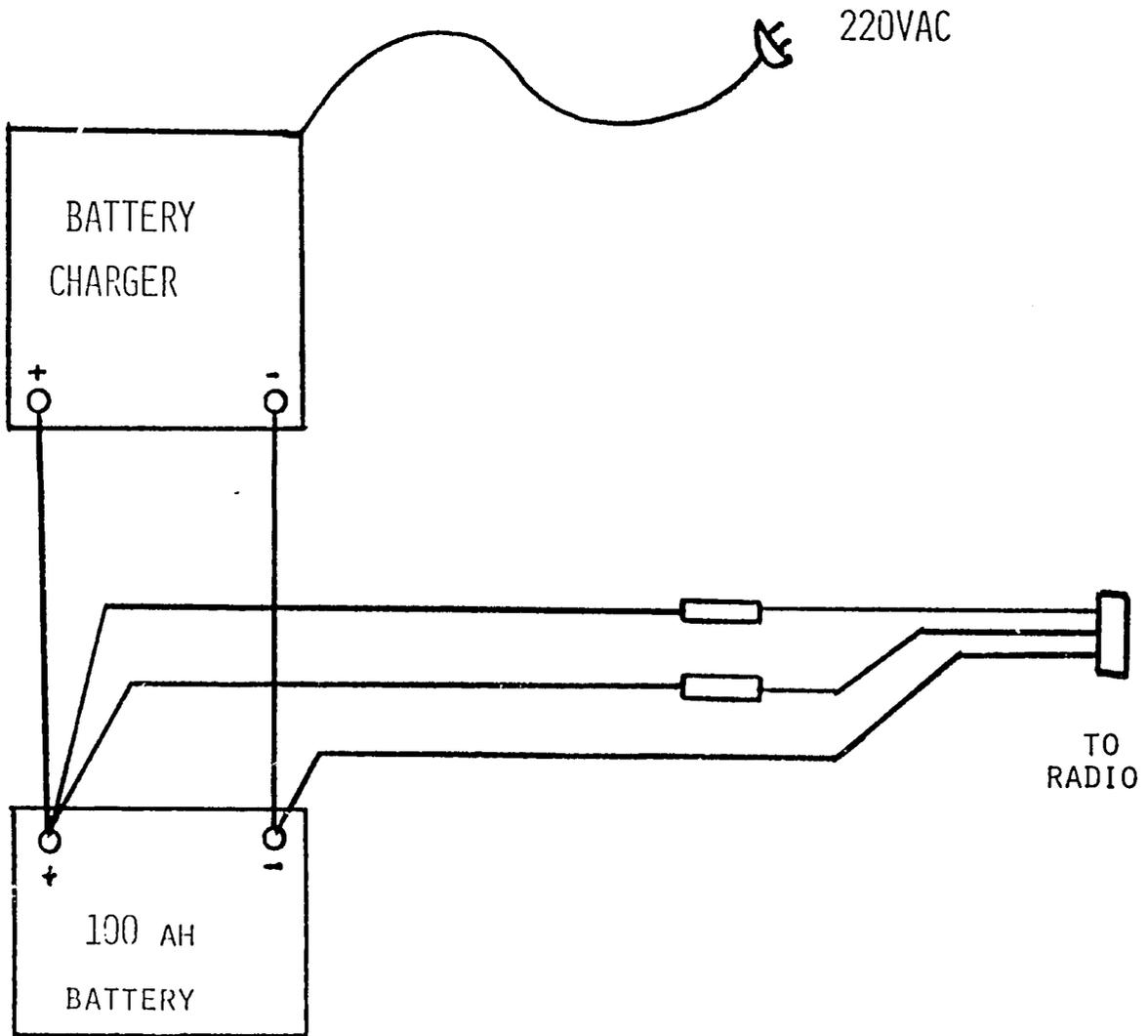
6. All battery terminals and connections must be clean and free of corrosion.
7. Install connectors and wires to the battery. Tighten securely and then apply a thick coat of grease to the terminals and connections to prevent corrosion.
8. Check battery liquid levels once each week. Remove the caps from each cell and check the level. If the level is below the fill indicator, add distilled water until the level is at the fill indicator.

"C A U T I O N"

Battery solution is extremely corrosive. Do not get the solution on skin, eyes, or clothing. If the solution is spilled on you seek immediate medical attention.

9. Operate the battery charger at all times except when servicing the battery or when making connections to the battery.
10. After each six month period, check the battery solution with a battery hydrometer. If the solution is not correct, have a battery technician service the battery.

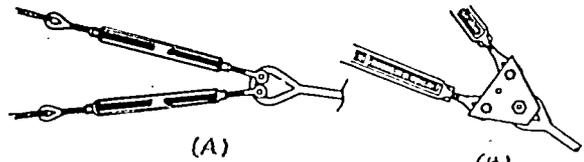
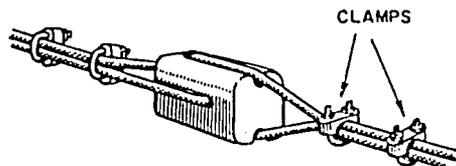
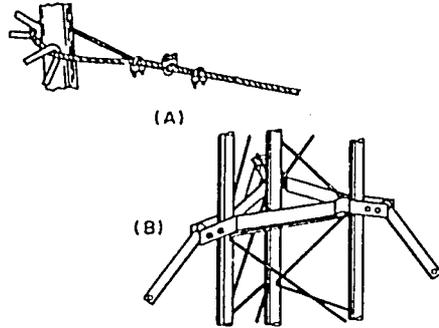
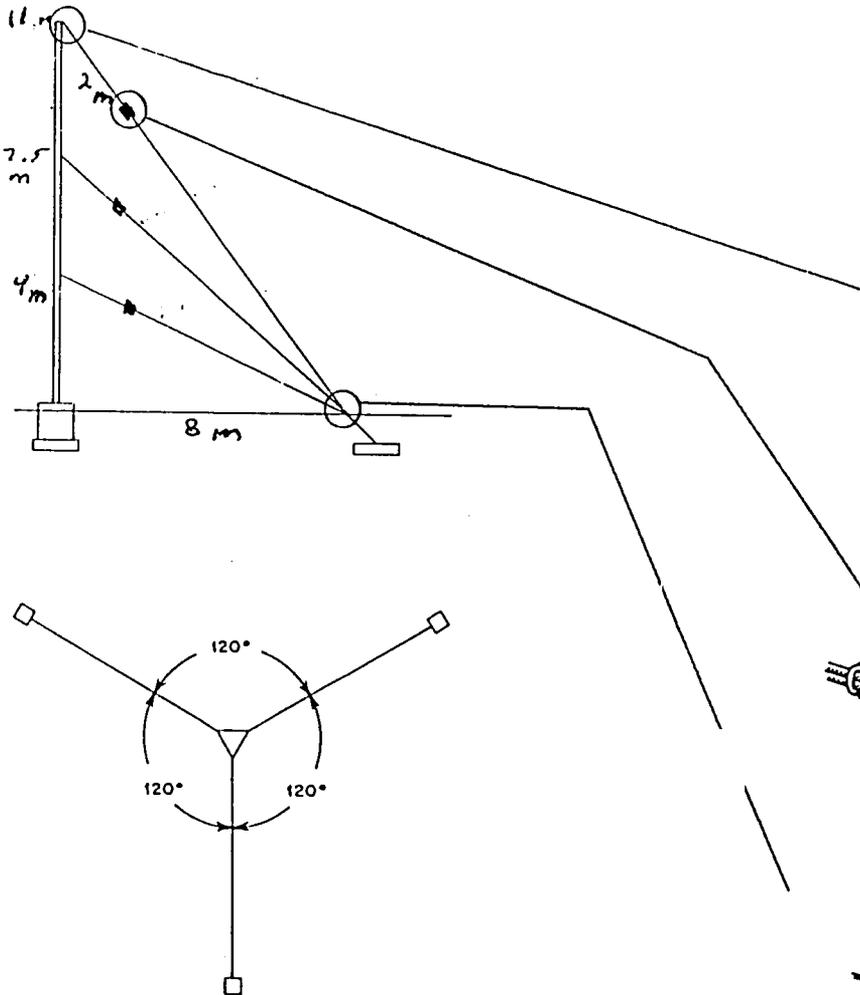
BATTERY INSTALLATION DIAGRAM



FIXED RADIO ANTENNA INSTALLATION

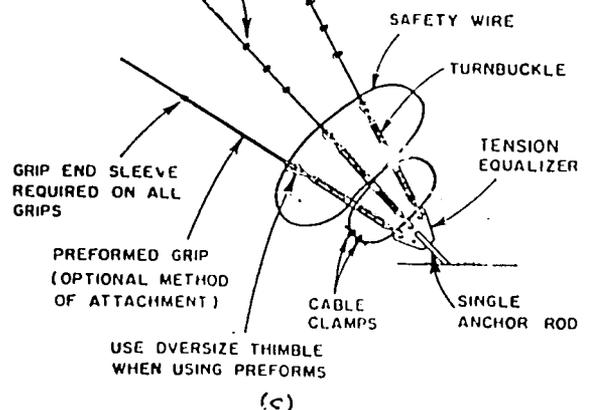
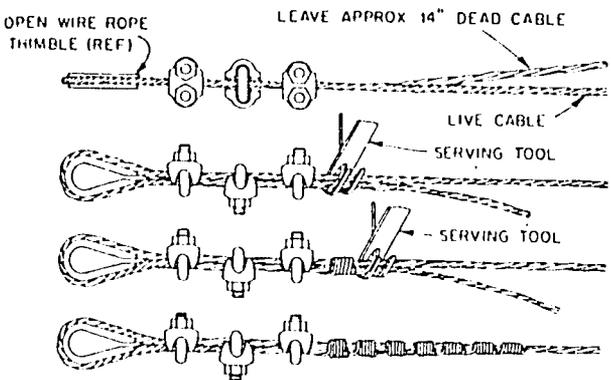
1. Antenna towers must be no closer than 15 meters to electric power wires.
2. The distance between the antenna towers should be 6 meters greater than the length of the antenna.
3. Antenna must be 10 meters above the ground and 10 meters from the nearest building.
4. The antenna support wires will have insulators installed as shown on the drawings.
5. Place anchors for the antenna support wires 8 meters distant from the antenna tower base.
6. Drive a ground rod 3 meters in length into the ground at the base of the antenna tower.
7. Connect the antenna tower and ground rod with 2 gauge wire or larger.
8. Details of the antenna base, antenna support anchors, and installation details are shown in the diagrams.
9. The coaxial cable must be at a 90 degree angle to the antenna.

ANTENNA INSTALLATION DIAGRAM



CABLE CLAMPS - SPACE CABLE CLAMPS 6 TIMES CABLE DIA APART. (U BOLT SHOULD BEAR ON DEAD END)

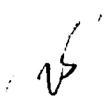
SERVE FREE (DEAD) END OF GUY AT EACH CONNECTION



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MOBILE RADIO INSTALLATION TIPS

1. Mount the radio in a suitable location that will permit access while the vehicle is in motion. The location must protect the radio from damage, and not offer a hazard to the driver or passenger.
2. Use shock/vibration isolators to mount radio in 4WD vehicles.
3. Locate antenna mount where it will not interfere with other mounted equipment.
4. Install the antenna coupler as close to the antenna mount as possible.
5. Route all power wires directly to the battery.
6. Where wiring must pass through walls, use protective grommets. If necessary to preserve watertight integrity, use bulkhead connectors.
7. Use correct size cable clamps to hold wiring in place and protect from abrasion.
8. Install appropriate RFI suppression devices on the vehicle.



MODIFICATION INSTRUCTIONS

ICOM-735 HF RADIO

The following instructions are furnished to assist in modifying the three ICOM radios recently received by the PPD.

1. With the transceiver right side up facing toward you, remove the 12 screws securing the top cover. Remove the top cover.

2. Remove the 4 screws securing the PA unit. Carefully lift the PA unit and set to the right side of the transceiver. Be careful not to unplug the speaker connection.

3. Look toward the rear of the radio for diodes D33 and D34. These are standing on end near the micro-processor. Remove diodes D33 and D34.

4. Install the PA unit into the radio and fasten with the four screws previously removed.

5. Place the top cover on the radio and fasten with the 12 screws removed in step 1. This completes the modification of the ICOM - 735 HF radio to permit all band operation.

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APPENDIX 7

RADIO OPERATING PROCEDURES

The attached radio operating procedures provide a standard training guide for users of the Plant Protection Division HF Radio System. When additional frequencies and radios become available, certain small changes in the procedures will be necessary. Recommend that these pages be reduced to 5 X 7 inch size, and laminated for durable ready reference by the operators.

MOBILE RADIO DAILY CHECKLIST

DATE

Y N

1. Is the water level in the battery correct?
2. Are the power wires for the radio securely connected to the battery?
3. Are the battery terminals and connections free from corrosion?
4. Are the power wires and the antenna cable free of cuts, nicks, and abrasions?
5. Are all the radio components securely fastened to the vehicle?
6. Check the antenna and mount. Is there any damage?
7. Is there a tie-down for the antenna?
8. Turn on the radio. Does the power light come on?
9. Adjust the volume and squelch controls. Select the proper channel and sideband position. Do all the radio controls function correctly?
9. Inspect the microphone and connector. Is it free of damage? Does the PTT switch work properly?
10. Is the radio turned off when not in use to prevent damage to the radio and battery?

SIGNATURE

If any answer is no, have the radio checked by your supervisor or a radio technician.

FIXED RADIO DAILY CHECKLIST

DATE

Y N

-
1. Is the water level in the battery correct?
 2. Are the radio power and battery charger wires securely connected to the battery?
 3. Are the battery terminals and connections free from corrosion?
 4. Is the battery charger operating correctly?
 5. Are the power wires and the antenna cable free of cuts, nicks, and abrasions?
 6. Is the radio securely fastened at the operating position?
 7. Check the antenna and antenna towers. Is there any damage?
 8. Turn on the radio. Does the power light come on?
 9. Adjust the volume and squelch controls. Select the proper channel and sideband position. Do all the radio controls function correctly?
 9. Inspect the microphone and connector. Is it free of damage? Does the PTT switch work properly?
 10. Is the radio turned off when not in use?

SIGNATURE

If any answer is no, have the radio checked by your supervisor or a radio technician.

NOTE: The battery charger must be plugged in and operating at all times except while servicing the battery or making electrical connections.

GENERAL RADIO OPERATING PROCEDURES

1. All radio stations will maintain a station log. This log will contain as a minimum:

Date	Time	Station Called	Channel or Frequency
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2. Keep copies of written messages sent by your station for a period of one week. Annotate on the message the date and time transmitted.

3. Difficult or confusing words will be spelled out using the standard international phonetic alphabet.

4. Use standard procedural words (pro-words) when appropriate.

5. Use of preformatted messages to minimize confusion or misunderstanding and to speed the forwarding of information.

6. Use call signs to minimize confusion and properly identify stations transmitting.

7. Fixed stations will use their location as the call sign. An example is: "El Fashir this is Khartoum, over".

8. Mobile stations will use the department they are operating in and a numerical identification. For example: "El Obeid this is El Obeid Mobile 2, over".

9. Transmissions should end with the word "Over" if you expect a reply or the word "Out" if no reply is expected.

PROCEDURAL WORDS

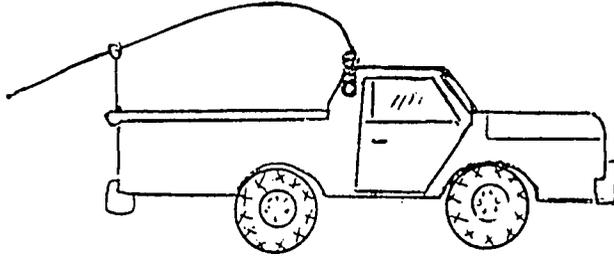
PRO-WORD	MEANING
Affirmative	Yes, or I agree with what you said
All After.....	Repeat all of your transmission after the word
All Before.....	Repeat all of your transmission before the word
Negative	No, or I do not agree with what you said
Out	I am finished, I do not expect a response
Over	I am finished, please respond
Roger	I received your transmission
Say again	Please repeat
Standby	I cannot transmit now but I will reply within one minute
Wait	I can not transmit now. I will call when able

INTERNATIONAL PHONETIC ALPHABET

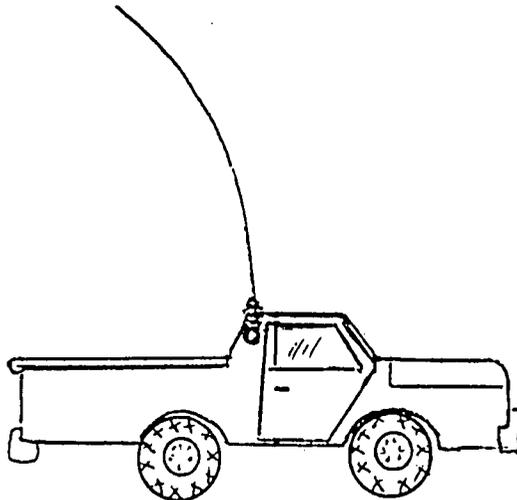
A	Alpha	N	November
B	Bravo	O	Oscar
C	Charlie	P	Papa
D	Delta	Q	Quebec
E	Echo	R	Romeo
F	Foxtrot	S	Sierra
G	Gulf	T	Tango
H	Hotel	U	Uniform
I	India	V	Victor
J	Juliet	W	Whiskey
K	Kilo	X	Xray
L	Lima	Y	Yankee
M	Mike	Z	Zulu

MOBILE ANTENNAS

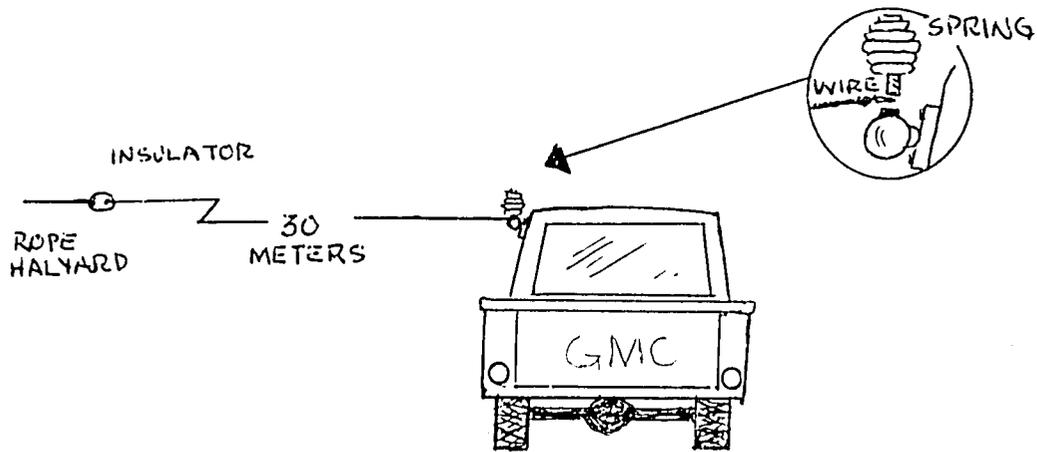
To increase the reliability of HF radio communications, mobile stations will sometimes need to change the antenna configuratio



Preferred configuration within 400 KM of the Base station



Preferred configuration over 400 KM to Base station



Expedient Antenna

If the whip antenna should break, you may use the above as a temporary antenna to maintain communications until the whip antenna is replaced.

APPENDIX 8

AIR-GROUND OPERATIONS

Communications for air - ground agricultural operations are essential for effective use of spray aircraft. The large areas that may be treated at one time make aircraft an essential part of the overall treatment effort. Limitations of various aircraft must also be considered in determining the type of communications used.

All aircraft have a VHF/AM communications capability in the band 118 - 136 MHz. This band however is limited to line of sight communications. Effective use of this band would be to nearby field survey and/or area marking teams. Many aircraft have an HF radio capability as well. The HF capability permits the aircraft a much greater communications range. This is essential for those aircraft operating at a great distance from the airfield. Flight following contact with support personnel is especially necessary when operating in sparsely populated areas.

Additional equipment should be acquired to provide for air - ground operations. This includes both portable and fixed VHF/AM radios and HF mobile radios for the support vehicles.

APPENDIX 9

USAID FIELD COMMUNICATIONS

Communications with USAID personnel operating with the PPD is required to provide accurate status of operations and coordination of support requirements. The MICOM-S radio in the GDO office has been configured to provide this capability. Instructions are furnished on using the radio and contact procedures.

MICOM-S OPERATING INSTRUCTIONS

1. Turn the power/volume control switch on. The power on light should come on. If the power light does not come on check to see that the cord from the power supply is plugged in to the wall socket.
2. Turn the channel selector knob to the appropriate channel.
3. Make sure the wooden knob is in the right most position.
4. The three push switches should be in the up position.
5. Use the sideband selector switch to select the sideband as shown in the net list.
6. Adjust the volume control for a comfortable listening level.
7. Depress the microphone switch to talk, release the switch to listen.
8. When calling another station, depress the microphone switch and say "(Name of station called) this is USAID, over" and release the microphone switch.
9. Adjust the clarifier control if the received speech is to high or low pitched.
10. When answering a call from another station, depress the microphone switch and say "(Name of station calling) this is USAID, go ahead (if you are ready to talk) or standby (if you cannot talk at that moment) over" and release the microphone switch.
11. All transmissions should end with the work "over" if you expect a reply or the word "out" if no reply is expected.
12. Use the phonetic alphabet to spell difficult words.

FOR PLANT PROTECTION DIVISION (PPD) NET

Channel 1	PPD Channel 1	4985 KHz Lower Sideband
Channel 2	PPD Channel 2	5340 KHz Lower Sideband
Channel 3	PPD Channel 3	5470 KHz Lower Sideband
Channel 4	PPD Channel 4	5935 KHz Lower Sideband

Callsigns: PPD (District) e.g.; PPD El Fashir

Ask for individual after 1400 hours local.

FOR UNDP

Channel 5	UNDP Camp El Fashir	9993 KHz Lower Sideband
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Callsign ZFJ2 Ask for Ron Libby or if not available for Robert Sidell UNDP Operations Officer.

THROUGH BERNA RADIO

Channel 6	Bern Switzerland	18023 KHz Upper Sideband
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Callsign: BERNA RADIO Ask for relay to ZFJ2 for Ron Libby or Robert Sidell

TELEX EL FASHIR

UNDP KHARTOUM
ROBERT SIDELL - UNDP-OPS-EL FASHIR

FOR USAID NET

Channel 7	USAID Primary	9354 KHz Upper Sideband
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Channel 8	USAID Alternate	9204 KHz Upper Sideband
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Callsigns: USAID

Delta Lima One	El Fashir
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Delta Lima Two	El Obeid
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Delta Lima Three	TDY Comm
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