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GHANA POLICE ASSESSMENT

SUMMARY OF FINDINGS, CONCLUSIONS, RECOMMENDATIONS AND EQUIPMENT SPECIFICATIONS - Sept. 12 - Oct. 23, 1968

REVIEWED AND DECLASSIFIED by John Weiss, OPS, February 24, 1975

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PREFACE

This study of the Ghana Police Service was predicated upon a request by the USAID Mission to Ghana for AID/W assistance in assessing a list of equipment requirements submitted by the Ghana Police to the USAID Mission.

The list of equipment identified police telecommunications and transportation equipment valued at over $2 million which would be funded under a US/Ghana loan agreement, Number 641-H-005 executed on June 19, 1967. This loan provides foreign exchange credits to the Government of Ghana for importation of commodities and equipment for both the private and public sectors of the economy. Counterpart deposit is required and provision must therefore be made by the Government of Ghana for any procurement.

The study was conducted during the period of September 23 to October 10, 1968, by Thomas Finn, Chief, Technical Services Division, and Paul Katz, Chief, Telecommunications Branch, Office of Public Safety, Agency for International Development (OPS/W).

The terms of reference governing the study stipulated an across-the-board review of the Ghana Police would be required to effectively evaluate the Ghanaian Police request for equipment since operational roles of the police elements in internal security, their capabilities and relative effectiveness are essential for such an evaluation. The

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team, therefore, examined at some depth the threat to Ghana's internal security and the ability of the Ghana Police Service to meet the threat.

Without exception the team members received excellent cooperation at all levels within the Ghana Police Service. Mr. John W.K. Harlley, Inspector General of Police and Vice Chairman of the National Liberation Council, took time out of an extremely busy schedule to meet with the team on two separate occasions. He issued instructions to his staff that expedited the team's study and also provided facilities including office space, transportation and secretarial assistance. The team visited each of the Ghana Police Headquarters' elements in Accra and the police facilities in the Volta, Tema, Eastern and Ashanti Regions. Frank, informal discussions held with all echelons of personnel within the force structure, provided the team with a perspective on operations that gives some balance to the more formal presentations found in the "Standing Orders" which govern the Ghana Police organization and as articulated by commanding officers. Thus the team's views reflected in this report were formed from "on site" observations, discussions with operational personnel, professional judgment and from research material provided by Ghana Police officials.

Assistance provided by Ambassador McElhiney, USAID Director, Richard M. Cashin, and other Country Team members is gratefully acknowledged.

SECTION II

SUMMARY OF FINDINGS AND CONCLUSIONS

The Nkrumah Regime which governed Ghana from its Independence in 1957 to February 24, 1966, was disposed toward gradually downgrading the Ghana Police Service to the maximum extent possible while still maintaining a public facade of support for the police. The force was stripped of its Border Patrol responsibilities, its Special Branch activities were emasculated and Nkrumah's informants effectively penetrated the police structure, thus inhibiting not only its independence, but most certainly its effectiveness. In place of a democratically responsive police organization a whole host of secret and clandestine police and internal security entities sprung up within the Presidential arena.[1/] These new organizations were more than adequately provided for in terms of budgetary support and equipment. Consequently, the police became marginal competitors within the internal security complex and suffered from serious, perennial shortages of equipment and manpower. Morale suffered greatly and concomitantly discipline declined, thus the organization's responsiveness was seriously affected. The police were totally disarmed in 1962 after an abortive attempt on Nkrumah's life by a police constable and subsequently ten Police Regional Commanders were summarily dismissed from the force.

1/ For an informative presentation on this subject see "Nkrumah's Subversion in Africa", Ministry of Information publication SPC/A/0327 dated November 1966.

Since the coup on February 24, 1966, which toppled Nkrumah, the Ghana Police has made steady progress toward restoring some of its former stature. The Border Guards were returned to police operational control, the Special Branch was reconstituted, police arms were returned and morale improved considerably. However, the Ghana Police Force has not yet completely emerged from the trauma of the Nkrumah Regime. The provision of equipment has not kept pace with the operational buildup of the police structure. Most of the equipment which became surplus when Nkrumah's private security forces were disbanded was parcelled out among various governmental departments. Much of the equipment, known to have been purchased, has disappeared while still more from Eastern bloc sources can not be used because of the lack of spare parts and indigenous maintenance capabilities.

Because of the police role in the coup of February 24, 1966, there are four members of the Ghana Police Force on the National Liberation Council (NLC). John Harlley, Inspector General of Police, is Vice Chairman of the NLC; while A.K. Deku, Commissioner of Police CID and Special Branch; J.E.O. Nonoo, Commissioner of Police Administration; and Deputy Commissioner B.A. Yakubu, are permanent members of the Council. Possibly because of their preccupation with the affairs of Government, it is the team's feeling that the top level police administrators have

not focused sufficient attention on managing and administering the police organization. There still exists serious equipment deficiencies within the police after over two years of NLC rule. What procurement has taken place has been haphazard at best with little regard for operational considerations. Some vehicles and communications equipment, for instance, were bought without consultation with the heads of the transportation or communications divisions of the police. Admittedly the lack of foreign exchange and the general plight of the economy are serious factors mitigating against programmed equipment purchases. Nevertheless, major procurements have been made without regard for equipment standardization, spare parts requirements and above all without predetermining the suitability of the equipment to the specific requirement.

There is no evidence to support a thesis that the police force is making strides to strengthen its administration and management. There is no research and planning element, there is little documentary data available on functions of the police elements, few organization charts were found, and statistics and records need much attention. Paradoxically the police officers and men are most impressive; they fully understand the scopes of their responsibilities and are cognizant of the many internal security problems facing the police today in their emerging society. The officers without exception are well

disciplined, experienced and seem to have the energy and desire to do the best job possible notwithstanding their limited equipment resources.

Details for essential minimal transportation and communications equipment needs are identified in the annex of this report.

Equipment alone, however, is not the answer. It is believed the U.S. should expand its efforts in participant training and this training should be geared to the senior and middle echelon officer levels. Such training is available at AID's International Police Academy (IPA) and every effort should be made by the U.S. to encourage Ghanaian police to take advantage of this training. Since the coup in 1966 sixteen officers have received training in the U.S. as follows:

> Twelve attended the IPA general course; two were trained in telecommunications management; and two received specialized training in firearms identification.

This effort is certainly commendable, but hardly sufficient to offset the vacuum in management talent created during the Nkrumah period.

There are troubled times ahead for the Ghana Police. The NLC intends to handover the reins of Government to civilian authority in September 1969. It is the consensus of police officers that competing pressures from political interests and public sector activities, once civilian power is restored, will all but overshadow the

needs of the police. Thus, time is short and efforts to strengthen the police should be well implemented prior to the turnover of political power in September 1969.

To attain the desired result of increased police efficiency in the shortest time frame possible, it is considered essential that a U.S. police assistance program designed to provide guidance to the Ghanaian Police Service in police management, records management, training and in communications systems and operations as well as engineering and maintenance be established. A generalist position and a communications position, in the opinion of the team members, represents the absolute minimum technical assistance necessary if the U.S. is to further the interests and future of the Ghana Police Service.

SECTION III

SUMMARY OF RECOMMENDATIONS

The Ghana Police Service requirements for communications and transportation equipment is critical. Training aids, crime laboratory items, investigation equipment, records processing equipment, i.e. filing and index cabinets, and office equipment and vehicle tool repair kits are also urgently needed. These needs, however, must take a lower priority than communications and transportation equipment requirements.

The types and numbers of equipment recommended were developed within the framework of the police capacity to absorb and maintain the equipment. Also, since the police must provide local currency counterpart funds to cover foreign exchange monies expended under the provisions of the loan agreement, the impact on the current and future years' police budget was discussed at length with the Police Finance Officer and the Inspector General of Police. They have assured the team that the necessary funds will be available for maintenance and operations and that agreements have been worked out with the Ministry of Economic Affairs and the Ministry of Finance to allow the police to procure the items recommended.

Transportation and Maintenance

The Ghana Police Service has on inventory 1020 vehicles of various makes and models. Of these, almost 40% are unserviceable, mostly due to the lack of spare parts. Cannibalization to obtain spare parts has been the rule, thus hulks of fairly recent vintage vehicles stripped for spare parts are in abundance at the various very good vehicle repair facilities throughout the country. Vehicle repair facilities are located at each of the regional cities. The main repair shop is located in Accra and it is capable of 4th echelon repairs. Facilities and capabilities vary from region to region and while each is adequately manned by trained mechanics and helpers, tools and test equipment are in very short supply. The Assistant Commissioner in charge of the repair shops has plans to establish 4th echelon repair capabilities at three regional centers. Unavailability of tools and test equipment, however, is proving to be a major obstacle to his plans. Again, trained manpower and physical facilities are available and with minimal amounts of test equipment and tools his plan could be carried out. There is no question in the team's mind concerning the ability of the Ghana Police to maintain any additional vehicles procured providing spare parts, tools and test equipment is available.

The conglomeration of types and makes of vehicles in the police inventory makes it virtually impossible for the police to maintain spare parts commensurate with the need. There are over 30 different makes of vehicles within the police inventory including British, Dutch, Russian, American, Japanese and Czechoslovakian types. For the most part, local dealers do not have sufficient spare parts on hand to provide a ready pipeline of spare parts support for the vehicles in the country. Orders must be placed with local distributors and because funds are short and foreign exchange requirements are difficult to arrange, much time is lost in obtaining even minimal spare parts.

The transportation situation in the Ashanti Region as noted below is typical of the problem found throughout the country. There are 75 police vehicles in the Ashanti Region, comprised of 15 different makes, 22 of which are beyond economical repair and 10 require major rework at the main vehicle repair facility in Accra.

Most of the police vehicles are pre-1965 models and have reached a point that even if spare parts were available, it would not be economically feasible to attempt to keep them running. The rate of vehicle attrition, therefore, will most certainly accelerate in the coming year because of the age and condition of the serviceable vehicles now on hand. Thus, the problem of lack of mobility which prevents the police from properly performing many functions such as mobile

patrol responding to requests for assistance and investigating complaints promptly must be relieved if the police are to be able to cope with the problems of maintaining law and order in the days ahead.

The police requested a total of 222 vehicles and 5 launches in the list of equipment submitted for USAID consideration as follows: (a) 60 patrol cars, (b) 60 troop carriers, (c) 30 Jeep type vehicles, (d) 24 heavy duty police sedans, (e) 12 utility vehicles to be used as communications repair trucks, (f) 12 ambulances and (g) 24 motorcycles. The cost, including spare parts, transportation and surcharges for this size procurement, has been estimated at $1,097,841.

The police have received cost estimates of $28,000 from two local boat distributors for 30 foot patrol craft. This figure appears on the low side and does not include costs for transportation or spare parts.

Recommendation 1

A. There are 101 Regional Police Headquarters, 61 Police Districts, 215 Police Stations and 209 Police Posts. With 656 serviceable vehicles on hand this would allow the assignment of 1.3 vehicles at each of the 495 police locations. Therefore, many districts, stations and posts have no transportation at

all while others are badly in need of additional patrol type vehicles. The provision of 52 patrol vehicles of the Chevy II type to supplement the 68 patrol vehicles presently assigned will permit assignment of two patrol vehicles in each of the 61 districts.

B. Four CJ-6 (4 wheel drive) Jeep type vehicles should be provided to each of the 10 regions to be used at the district and station levels and/or posts for general police purposes, i.e. patrol, transporting men to fixed stations, hauling materials and as backup for riot control purposes.

C. Each of the 10 regions should have a utility vehicle to be used by the communications office to allow regular periodic visits to regional communications sites for repair and maintenance purposes.

D. Each reserve component (31 man platoons) should have its own transportation. Recently the Ghana Police procured 12 Commer 7 ton vehicles specially configured as troop carriers. These vehicles have been dispatched to reserve components in the regions. Since each region has, or soon will have, 4 platoons of reserves each, it is recommended that 28 additional troop carriers, International Harvester model, stake body type, be provided to round out the troop transport requirement of 4 carriers at each region.

E. The police provide ambulance service for the community. Various types of vehicles are now used as ambulances since only two such specially equipped vehicles are in the police inventory. This raises questions about the patient's welfare during transportation to the hospital and is of serious concern to the police. It is considered essential, therefore, that each regional headquarters have one ambulance for emergency use.

F. Motorcycles are the established method of transporting mail, sending special messages, and used for all around purposes in the traffic division. The motorcycles on hand are mostly Czechoslovakian makes that are unserviceable. Spare parts are not found locally and there is a reluctance to use foreign exchange for procurement of spare parts from Eastern Block countries. Again, the only answer for the police has been cannibalization and by this process they have immobilized 133 of a total of 163 motorcycles on hand. This fact has not diminished the need for motorcycles. Therefore, it is recommended that two motorcycles be provided to each region to work with the traffic police and reserve components.

The team can not support the request for either launches or highway patrol vehicles. The 5 launches requested were to be provided to the Border Police for anti-smuggling operations along the Togo and Ivory Coast borders and for use in the two port areas of Tema and Takoradi. While the team diligently attempted to determine the scope of the proposed operation in terms of firm operational plans and maintenance and manpower capabilities, this information was not forthcoming. It seems there is a question as to just how many boats the Border Police have on hand. The team was informed at Border Police Headquarters that 4 boats were in operation; one each at Tema and Takoradi and one each at the Togo and Ivory Coast borders. Also, two more were under construction at a shipyard in Takoradi. The specifications of the boats were not available, but it was stated that the boats could be seen when the team visited the areas where the boats were located. At Tema it was learned that the boat there had been sent to Takoradi for repairs several months ago. The police were sharing a boat belonging to the customs service to board incoming ships. There is a police boat at Takoradi and it is operational. It is a 35 foot launch with one inboard motor that was built about 5 years ago, and it is capable of making about 8 knots per hour. The detail specifications of the boat were not available. At the shipyard in Takoradi one boat which was built for Nkrumah is nearing completion. It is a

45 foot cabin class craft, fully fitted with showers and airconditioning and powered by two Mercedes 120 HP motors. This boat is to be turned over to the Border Police. The shipyard manager informed the team that within the past 6 months he had turned over four 22 foot boats, each powered by two Volvo Pinto 110 HP motors, to the police for border patrol purposes. The Border Police are not aware of this and it is assumed the craft might have been absorbed by the Navy. The shipbuilding facility at Takoradi is sufficiently well equipped and technically capable of building any boats that may be required by the Border Police. It is suggested, therefore, that if an operational requirement exists for additional boats and maintenance facilities are available to support these boats, they should be built locally thereby minimizing foreign exchange requirements.

Patrol vehicles for highway patrol purposes are not considered essential at this time. Road conditions in Ghana are poor and there is no single entity within the Ghana Police Service charged with responsibility for highway patrol activities.

The responsibility for conducting highway patrols is vested with the Regional Commanders. The team learned that little is actually done in this area because of the extreme shortages of vehicles. With the provision of vehicles as programmed above for transportation within the regions, sufficient vehicles should be available to permit the Regional Commanders to conduct highway patrols as may be required.

Recapitulation of Transportation Recommendations

Types	Activity	Requested	Recommended	Costs
Patrol vehicles	(Urban)	60	52	$142,896
Troop carriers	(Reserve)	60	28	248,164
Jeep type	(Rural)	30	40	140,160
Highway patrol vehicles		24	0	- 0 -
Utility vans	(Communications)	12	10	46,340
Ambulances	(Each Region)	12	10	67,608
Motorcycles	(Traffic)	24	20	39,940
Launches	(Messenger service)	5	0	- 0 -
		227	140	$685,108 *

* Includes 20% spare parts, 5% surcharge and ocean freight charges.

Communications

Through dedication and improvisation, the Communications personnel of the Ghanaian Police Force have exerted considerable effort to provide essential communications in support of their overall police mission. To a large degree, however, these efforts are being dissipated due to communications problems dealing with planning, logistics, operational procedures, lack of sufficient trained personnel, inadequate and obsolete facilities and equipment and minimal budget support. Unless the communications situation is corrected, even the limited abilities now held by the police force may be lost with the resultant decrease in police effectiveness.

In studying support for the Ghanaian Police country-wide communications system, existing and proposed telecommunications systems of the GOG were examined to avert possible duplication or parallel systems. The P & T country-wide microwave communication system, which was recently completed, was examined to determine its suitability for use by the police to alleviate heavy administrative traffic. At the suggestion of the team the police are now planning to lease P & T teletype channels from Accra to each of their subordinate regional headquarters using American teletype equipment for administrative traffic.

Areas Requiring Improvement

1. To send administrative and security traffic, the police presently operate a basic point-to-point HF/SSB radio telegraph and 'phone network, connecting their headquarters in Accra with the regions. The communications system at best provides slow service. An insufficient number of technical personnel, limited technical capabilities, inadequate and obsolete facilities and equipment and lack of sufficient budgetary support, contribute to the general unreliability of the radio telegraph network.
2. For the most part the VHF/AM equipment utilized by the police for fixed and mobile operations in the major cities is antiquated, in poor condition and of minimum usefulness.
3. The border police are presently without any means of communication because of the lack of suitable tactical radio communications equipment.
4. On several occasions radio equipment to satisfy certain police operational requirements has been purchased without regard to its technical suitability or ensuing maintenance problems. This has contributed in part to nonstandardization of equipment resulting in accumulation of similar equipment from different manufacturers. Nonstandardization combined with the lack of budgetary

support to properly maintain the radio equipment has resulted in the cannibalization of numerous units.

Recommendation 2

To effect an efficient communications capability, the Ghanaian Police are in need of:

1. Additional budgetary support to sustain their communications systems.
2. Adequate and suitable communications equipment with which to work.
3. Additional technically trained officers and men to provide proper maintenance and operational guidance.
4. Modernization of existing communications systems and buildings to provide the reliability and versatility essential to police operations.
5. U.S. technical assistance in the form of a Public Safety Communications Advisor to assist in effective planning, organization and administration of human resources, and sound programs for training to assure effective installation, maintenance and operation of a communications system in support of police operations.

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By the incorporation of some changes in the existing police communications systems and the acquisition of modern radio equipment responsive to the country's specific requirements, the police can, in conjunction with U.S. technical assistance, improve their potential dramatically.

To effect an efficient communications capability for the Ghanaian Police, the GOG must provide sufficient funds to sustain existing equipment, modernize present facilities and utilize recommended P & T facilities. Given this GOG action, the U.S. should approve the loan for police radio equipment specified in Attachment I and provide the services of one Public Safety Communications Advisor for a minimum period of two years.

Technical Assistance Recommendations

A. The Ghana Police Service has not been substantially reorganized since Ghana gained independence in 1957. Minor structural changes have been made such as changing the title of the Chief of the Service from Commissioner to Inspector General of Police and realigning headquarters' functions under two commissioners rather than three deputy commissioners as was the case in 1964.

There is a need to regroup staff elements to more clearly define lines of command for functional activities. Technical Services,

for instance, are shared by the Deputy Commissioner of Police for Administration and Deputy Commissioner of Police for Operations and there is little if any coordination at this level. Communications, transportation and statistics are under the cognizance of the Deputy Commissioner for Operations while the vehicle maintenance activities, building workshops and licensing of servants are under the Deputy Commissioner for Administration. Personnel responsibilities are shared by all headquarters' elements while the Staff Officer (Executive Officer) plays probably the most important role in the personnel function.

The Staff Officer has expressed interest in reorganizing the the Force and had asked for some guidance from team members. Based upon many discussions with senior police officers, both formal and informal, concerning organizational and management problems, it is believed that technical assistance in such areas as organization, administration, training, records management and statistics is essential. Many of the police administrators with whom the team came into contact have indicated that they have been grappling with organizational and administrative problems for some time, but they did not express much hope that the force structure will be substantially changed in the immediate future.

What is needed is an impetus which the team believes can be provided by the assignment of a senior Public Safety Advisor who can offer technical guidance in the management of the police, human and material resources.

B. The expansion of the police communications capability will place a tremendous burden on the shoulders of the Chief Wireless Officer, Chief Superintendent, John Agamah. He received his formal communications training in England and is a U.S. trained participant in communications management (1967). He is one of the most capable and dedicated young officers the team has met. Despite his very impressive credentials, he will be unable to cope with the technical requirements of installing, maintaining and managing a moderately complex telecommunications system. He needs assistance in developing more effective police communications systems, operations and maintenance. Curriculum for technicians' training in transistor theory must be developed as well as familiarization courses for the use of requested new test equipment. Also, a great deal of day to day guidance in sound electronic engineering concepts as applicable to police communications is essential. Unless the assistance of a Public Safety Communications Advisor is made a part of this

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Activity, the team seriously questions the wisdom of the U.S. assisting the police in any large scale procurement of a U.S. communications equipment. To assist the police by providing large amounts of equipment without communications advisory services, the U.S. runs the risk of being tainted with responsibility for what is sure to develop into a worsening of the police communications capability.

SECTION IV

SUMMARY OF COSTS

A. Vehicles with 20% Spare Parts, 5% Surcharge & Ocean Freight

Item	Number	Description	Cost
1. Patrol Vehicle	52	Chevrolet II	$142,896
2. Troop Carrier	28	International Harvester	248,164
3. Rural Patrol	40	Jeep CJ-6	140,160
4. Utility Vans	10	Chevrolet Carryalls	46,340
5. Ambulances	10	International Harvester	67,608
6. Motorcycles	20	Harley Davidson-(900cc)	39,940
		Sub Total	$685,108

B. Spare Parts for Repair of Vehicles on Hand

1. Jeep	$ 5,665
2. International Harvester	5,700
3. Chevrolet II	8,106
Sub Total	$ 19,471

C. Tools

1. Master Tool Kits	3 ea. one for ea. 4th echelon repair facility	$ 8,507
2. General Mechanics	10 ea. one for Regional Shops	4,013
	Sub Total	$ 12,520

D. Training Aids and Text Books

1. Two 16 MM Movie Projectors & Spare Parts	$ 2,340
2. Ten Police Films	810
3. Two 35 MM Slide Projector Carousel with Accessories and Spare Parts	340
4. Two Overhead Projectors and Accessories	500
5. Two Projector Screens	146
6. Four Transparency Kits	130
7. 32 Police Text Books	319
Sub Total	$ 4,585

E. Communications Equipment

1.	Administrative Radio Network	HF/SSB & VHF/ Multiplex equipment	$119,194
2.	Leased Microwave Channels	Teletype equipment	106,726
3.	City Police Administrative Patrol and Reserve force Network	VHF/FM transceivers and accessories	260,227
4.	Border Guard Network	VHF/FM transceivers and accessories	160,322
5.	Maintenance Facility	Test equipment and tools	50,508
6.	Police Radio School	Training Aids	26,187
		Sub Total	$723,164
		GRAND TOTAL	$1,443,818

ATTACHMENT: ANNEX

ANNEX

ITEM	QUANTITY	DESCRIPTION
1	52 ea.	Sedan, 4 door (Law enforcement) Chevrolet or equal minimum 106 inch wheelbase Interim Federal Specifications KKK-A-00811i (GSA-FSS) dated March 15, 1967.

Table I Type I with the following options:

a. Right hand drive
b. Low compression 6 cylinder engine
c. Locking gas cap
d. HD alternator
e. HD battery
f. HD shocks
g. HD springs
h. Manual synchromesh transmission
i. Speedometer in miles
j. Tires w/tubes - 6 PR
k. Operators manual
l. Shop manual (1 each for every 10 vehicles)
m. Parts manual (1 each for every 10 vehicles)
n. Rotating blue light mounted on roof
o. Siren mounted under hood
p. Color - blue, w/white top

ESTIMATED COST

Vehicle	$1800.
20% spare parts	360.
5% surcharge	90.
Ocean Freight	498.

52 X $2748. = $142,896.

ITEM	QUANTITY	DESCRIPTION
2	28 ea.	Truck, Stake Body (12 foot) 4 x 4 wheel drive, gasoline powered minimum GVW 18,000 lbs., maximum wheelbase 157 inches, in accordance with Interim Federal Specifications KKK-T-706a. Dodge W-500 or equal with the following optional equipment:

a. Right hand drive

b. Low compression 6 cylinder engine

c. Locking gas cap

d. Manual 4 speed synchromesh transmission

e. Tires w/tubes 10 PR

f. Brakes, Hydraulic, vacuum power assisted

g. HD radiator (Tropical operation)

h. Speedometer in miles

i. Operators manual

j. Shop manual (1 each for every 10 vehicles)

parts manual (1 each for every 10 vehicles)

k. Hinged longitudinal seats one on each side of vehicle body

l. Rotating blue light mounted on cab

m. Siren, mounted under hood

n. Canvas top with bows

o. Color Blue w/white top

ESTIMATED COST	
Vehicle	$5500.
20% spare parts	1100.
5% surcharge	275.
Ocean Freight	1988.
28 X	$8863. = $248,164.

ITEM	QUANTITY	DESCRIPTION
3	40 ea.	Truck, 4 x 4, gasoline powered in accordance with Interim Federal Specifications KKK-T-00645d (GSA-FSS) Table I, Type II, wheelbase 101" minimum GVW 3900 lbs. minimum, Kaiser Jeep Model CJ-6 or equal with the following optional equipment:

a. Right hand drive

b. Low compression 4 cylinder engine

c. Locking gas cap

d. Manual synchromesh transmission

e. Tires w/tubes 6 P.R.

f. Speedometer in miles

g. HD alternator (40 amp minimum)

h. HD shocks

i. HD radiator (tropical operation)

j. HD springs

k. Rotating blue light mounted on roof

l. Siren mounted under hood

m. Operators manual

n. Shop manual (1 each for every 10 vehicles)

o. Parts manual (1 each for every 10 vehicles)

p. Color blue w/white top

q. Hinged doors

ESTIMATED COST	
Vehicle	$2550.
20% spare parts	510.
5% surcharge	127.
Ocean Freight	317.
40 X	$3504. = $140,160.

ITEM	QUANTITY	DESCRIPTION
4	10 ea.	Truck, carryall, 4 x 4, minimum GVN 4500 lbs., minimum wheelbase 110 inches in accordance with Interim Federal Specifications KKK-T 00645d (GSA-FSS) Table I Type IIIa Chevrolet carryall K10 or equal with the following optional equipment:

a. Right hand drive

b. Low compression 6 cylinder

c. Locking gas cap

d. Manual synchromesh transmission

e. Tires w/tubes 6 P.R.

f. Speedometer in miles

g. HD alternator (60 amp minimum)

h. HD shocks

i. HD springs

j. HD radiator - (Tropical Operation).

k. Rotating red light mounted on roof

l. Siren mounted under hood

m. Operators manual

n. Shop manual (1 each for every 10 vehicles)

o. Parts manual (1 each for every 10 vehicles)

p. Color blue body w/white top

ESTIMATED COST

Vehicle	$3200.
20% spare parts	640.
5% surcharge	160.
Ocean freight	634.
10 X	$4634. = $46,340.

ITEM	QUANTITY	DESCRIPTION
5	10 each	Truck, Panel 4 x 4 wheel drive with ambulance conversion, IHC Model 1100C with Springfield Conv, or equal, in accordance with Interim Federal Specifications KKK-T-00645d. Table I, Type IVb minimum 5,000 lb.GVW with the following optional equipment:

a. Right hand drive

b. Manual synchromesh transmission

c. Tires w/tubes 6 PR

d. HD springs

e. HD shocks

f. HD alternator (40 amp minimum)

f. HD battery

h. HD radiator (Tropical operation)

i. Locking gas cap

j. Speedometer in miles

k. Low compression 6 cylinder engine

l. Operator's manual

m. Shop manual (1 each for every 3 vehicles)

n. Parts manual (1 each for every 3 vehicles)

o. Color white

p. Body, including Drive Compartment

Body to be capable of accommodating two ambulance patients, one on a wheeled cot and the other on an overhead collapsible

aluminum stretcher from ceiling above lower cot. Cab seat to be full with capability of seating two or more persons. Body to be totally enclosed with two extra wide doors at rear of body. Doors to have maximum head clearance and be equipped with inside control handle. Roof to be reinforced and equipped with brackets for suspending overhead stretcher.

Sliding glass windows to be provided in partition between cab and rear compartment. Medicine cabinet and linen cabinet to be provided in rear compartment. Rear step to be wide and of heavy construction with stainless steel kickplate. Door bottom scuff protection molding to be of stainless steel.

Head Room: ..... To be at least 60 in. from floor to roof, inside clearance.

Interior Floor Width: .. To be at least 66 in. inside clearance.

Windows: ..... In addition to the sliding glass partition windows, there are to be windows in each rear door and in each side of the body. All

windows to be of tinted safety type glass.

Compartments...Body to be equipped with compartments for two-way radio, two large fire extinquishers, MSA pneolator, and small tools and appliances. All outside compartments to be equipped with water-proof doors with heavy duty, safety type, concealed hinges, handles to be recessed.

Trim..... Interior finish to be completely washable, color to blend with overall color scheme. Hardware on cabinets to be chrome finish. Rear compartment to have fresh air intake.

Upholstering:..All seat cushions to be of foam rubber, or equivalent, with leatherett covering. Upholstery to be washable and color to blend with vehicle color.

Floor Covering:Cab to be equipped with conventional covering. Rear compartment to be equipped with heavy gauge linoleum or standard vinyl.

Lights and Accessories:

1. Courtesy lights in cab
2. Rear compartment loading lights

3. Rear compartment stepwell courtesy light with automatic switches on doors and manual switch on instrument panel.
4. Revolving chrome blue light, 360° type. Roof mounted.
5. Chrome flashing rear and front roof lights.
6. One dome light in rear compartment.
7. Automatic back-up lights.
8. Directional signal lights.
9. Chrome spotlight on left hand side.
10. Rheostat switch for dimming rear compartment light.
11. Jewel light on instrument panel to indicate when rear door is open.
12. Grill mounted chrome Federal, siren (or equal).
13. Pullman type (chrome) fan in rear compartment.
14. Two stretchers.

ESTIMATED COST

Vehicle	$3500.	
20% spare parts	700.	
5% surcharge	175.	
Ocean Freight	1259.	
10 X	$5634.	= $67,608.

ITEM	QUANTITY	DESCRIPTION
6	20 each	MOTORCYCLE, 2-wheel, 2-cylinder OHV engine, minimum 55 CID 900CC to be manufacturer's latest model furnished with all tools, equipment, and accessories normally supplied, including the following:

a. Transmission, 4-speed, footshift and hand clutch.

b. Rear suspension, swing arm type, hydraulically operated.

c. Front fork, hydraulic type.

d. Handle bars, U.S. Police type, suitable Kick-stand.

e. Lights: Headlight, sealed beam, w/handle bar control switch; pursuit lights, 2 sealed beam, red lens, mounted on left and right side of headlight; combination stop-tail light with reflectorized lens; turn signal lights.

f. Windshield, plastic adjustable, hydra-slide fork windshield.

g. Deluxe solo saddle seat.

k. Ignition to be shielded to prevent radio interference.

l. Rear view mirror, handle-bar type mounted on left side.

m. Painted: blue

n. Type of starter: KICK type

o. Wheel (rim) size. Front -- 19"; Rear -- 18".

p. Tires: front--19 x 3.50, 4-ply; Rear--18 x 4, 4-ply.

q. Brakes: Hydraulic, front--8", rear--8".

r. Electrical system, 12 volts, battery, generator, coil, and regulator.

s. Fuel capacity: 3.96 gallons.

t. Controls: As provided on Harley Davison XLH Sportster, or equal.

u. Fenders: Standard, front and rear.

v. Dimensions, wheelbase, etc: Wheelbase--58½, Saddle height--30½", minimum ground clearance -- 4 1/8".

w. Boxed for export shipment, steel banding required.

ESTIMATED COST

Vehicle	$1550.
20% spare parts	310.
5% surcharge	77.
Ocean freight	60.
20 X	$1997. = $39,940.

Item	Quantity	Description	Total Cost
6A		Detailed spare parts lists for vehicles now in the police inventory will be developed subsequent to AID/W approval for this procurement.	
		Estimated costs for spare parts.	$19,471
6B	3 ea.	Shop-Master Set, Snap-on No. 5592-GS-B for General Automotive Service	8,507
6C	10 ea.	Mechanic General Purpose Set-Snap-On No. 5110F-GS-B SOURCE: Snap-on Tools Corp. Kenosha, Wisconsin	4,013

The successful bidders must submit a recommended spare parts list for items 1 through 6 within 30 days after the date of contract. This list showing factory prices will not exceed 20% of the total FOB price of the commodity. The spare parts lists, catalogs and manuals are to be airmailed to:

Technical Services Division
Office of Public Safety
Agency for International Development
Washington, D.C. 20523

Malfettos Specs

Item	Quantity	Description	Total Cost
7	2 ea.	PROJECTOR, 16 MM Optical Sound with Automatic Threading, same as Bell and Howell Model 552 EX, to operate on 220 volts 50 cycles, having the following spare parts and accessories: a. Lamp kit, consisting of 3 projection lamps, 1 exciter lamp, 1 pilot lamp b. Drive belt, takeup (timing) c. Drive belt, rewind (timing) d. Drive belt, mechanism (flat) e. Drive belt, blower ("V") f. Fabric takeup belt g. Aperture brush h. Projector cover i. Orchestrican II speaker j. Complete tube replacement kit k. Service Manual for 550, 552 and 552EX projectors	$2,340

Item	Quantity	Description	Total Cost
8	1 ea.	Police Training Films as follows:	$810
		a. APPREHENSION AND SEARCH OF PERSONS 16mm/sd/b&w/27min/1956USARMY Source: Army Pictorial Center	
		b. CRIMINAL INTERROGATION 16mm/sd/color/19min Source: Texas Dept. of Public Safety through Jamieson Film Co.	
		c. DETECTING AND RECORDING SKIDMARKS 16mm/sd/b&w/10min Source: Dallas Jones Productions	
		d. FOOT PATROL 16mm/sd/b&w/27min Source: Los Angeles Police Department	
		e. HIT AND RUN ACCIDENT INVESTIGATION 16mm/sd/b&w/10min Source: Dallas Jones Productions	
		f. INVESTIGATION OF NARCOTICS OFFENSES 16mm/sd/b&w/40min/1958/USARMY Source: Army Pictorial Center	
		g. SUBJECT: NARCOTICS 16mm/sd/b&w/21min Source: Narcotics Educational Foundation of America	

Item	Quantity	Description	Total Cost
		h. PROTESTING THE ACCIDENT SCENE 16mm/sd/b&w/10min Source: Dallas Jones Productions	
		i. QUESTIONING DRIVERS AND WITNESSES IN ACCIDENT CASES 16mm/sd/b&w/10min Source: Dallas Jones Productions	
		j. SELF DEFENSE AND DISARMAMENT 16mm/sd/b&w/19min Source: Los Angeles Police Department	
9	2 ea.	PROJECTOR, SLIDE, Kodak Model Carousel 700,"or equal",equipped with Ektanar 5 inch f3.5 lens and to operate a 220 volts 50 cycle A-C. The following spares are required: a. 10 each Kodak Carousel Universal tray. b. 2 each 500 watt DEK lamps to fit this projector.	$340

Item	Quantity	Description	Total Cost
10	2 ea.	PROJECTOR, Overhead, Bell and Howell, Model 301AXE, or equal, to operate on 220 volts 50 cycle with the following accessories: a. Roll feed attachment b. Transparency positioner c. Work organizer shelves (pair) d. Convenient carrying handle e. Protective storage cover f. 50' roll of .055" acetate sheeting g. 35' roll of .005" acetate sheeting	$500
11	2 ea.	SCREEN, Projector, with white-magic beaded surface, size 70" x 70", heavy duty, gable type aluminum legs with cast hooded leg bracket make tripod. Features to include automatic fabric lock, roller lock and leg lock with toe touch release. Da-Lite Model "Special Picture King", or equal. Source of procurement: Da-Lite Screen Co. Inc., Warsaw, Indiana	$146.

Item	Quantity	Description	Total Cost
12	2 ea.	Transparency Preparation Kit consisting of: a. 50 mounting frames b. 2 ea. five color pen packages c. 1 coloring pencil package d. 20 sheets adhesive back color film e. 1 roll transparent tape bottle lens cleaner f. 1 package of 150 sheets of write-on film, Catalog - Minnesota Mining & Manufacturing, 10-64	$120
13	2 ea.	Kodak Carousel 135 slide transparency Kit containing material necessary to mount 50 ea. 2X2 slides in glass for use in Kodak Carousel projector - Kit includes 50 Kodak mounted binders, 50 masks for glass slides (135 for 24 x 36 MM transparency, 100 pieces of Kodak slide cover glass).	$ 10

Item	Quantity	Description	Total Cost
14		Police Text Books, as follows:	$319
	1 ea.	An Introduction to Criminalistics: O'Hara	
	1 ea.	An Introduction to Tool Marks, Firearms and the Striagraph: Davis	
	1 ea.	Art of Cross-Examination: Wallman	
	1 ea.	Causes of Crime: Pakenham	
	1 ea.	Criminal Interrogation: Aubry	
	1 ea.	Crime Laboratory: Kirk-Bradford	
	1 ea.	Crime Investigation: Kirk	
	1 ea.	Crime of Passion: Goodman	
	1 ea.	Criminal, The: Vollmar	
	1 ea.	Criminal Investigation: Gross	
	1 ea.	Criminology: Taft	
	1 ea.	Crowd and Riot Control: Applegate	
	1 ea.	Dictionary of Poisons: Mellan	
	1 ea.	Elements of Police Science: Perkins	
	1 ea.	Explosives and Homemade Bombs: Stoffel	
	1 ea.	Enigma of Drug Addiction: Brown	
	1 ea.	Eyewitness Identification in Criminal Cases: Wall	
	1 ea.	Field Interrogation: Bliss	

Item	Quantity	Description	Total Cost
	1 ea.	Firearms, Investigation, Identification and Evidence: Hatcher	
	1 ea.	First Aid and Resuscitation: Young	
	1 ea.	Forgery and Fictitious Checks: Sternitzky	
	1 ea.	Juvenile Delinquency: Tappan	
	1 ea.	Juvenile Offenders: Vedder	
	1 ea.	Narcotics and Narcotic Addiction: Mauer	
	2 ea.	Police Administration: Wilson	
	1 ea.	Police Patrol: Holcomb	
	1 ea.	Police Personnel Management: Germann	
	1 ea.	Police Work with Juveniles: Kenney	
	1 ea.	Riot Control: Wood	
	1 ea.	Sexual Criminal, The: De River	
	1 ea.	Traffic Accident Investigator's Manual for Police: Baker	

START TeLecom ITEMS:

OPS/FM-1B/5B EQUIPMENT

Item	Quantity	GSA Contr. Item No.	Description	
15	341 ea.	2 ~~261.80~~	OPS/FM-1B, Two Frequency Transceiver	275.30
16	361 ea.	4 ~~383.85~~	OPS/FM-5B, Two Frequency Transceiver	397.50
17	752 ea.	5 ~~.82~~	OPS/AE-1, Flex, Whip Antenna	1.01
18	727 ea.	6 ~~2.63~~	OPS/AE-2, Ant. Adapter Connector	2.78
19	351 ea.	7 ~~2.45~~	OPS/AE-3, 90 degree coaxial connector	2.48
20	276 ea.	8 ~~8.84~~	OPS/AE-4, Ground plane antenna	9.34
21	73 ea.	9 ~~9.23~~	OPS/AE-5, Gutter Antenna Bracket	9.31
22	125 ea.	10 ~~11.93~~	OPS/AE-6, Magnetic Antenna Bracket	13.20
23	26 ea.	11 ~~7.89~~	OPS/AE-7, RG-58A/U, Trans. Line	9.67
24	262 ea.	12 ~~13.59~~	OPS/AE-8, RG-8/U, Trans. Line	14.36
25	13 ea.	14 ~~17.81~~	OPS/AE-10, Tact. High Gain Antenna	19.78
26	13 ea.	15 ~~45.75~~	OPS/AE-13, Log Periodic Antenna	50.46
27	135 ea.	16a ~~120.00~~	OPS/PS/A-16 AC Power Supply	130.15
28	3 ea.	16b ~~48.00~~	OPS/PS/A-16 Charger Battery Case	49.66
29	341 ea.	17 ~~2.53~~	OPS/CC-1, Carrying strap, FM-1B	3.66
30	91 ea.	18 ~~20.45~~	OPS/CC-16, Carrying case, FM-5B	21.71
31	24 ea.	19 ~~25.80~~	OPS/BS-25, Nickel Cadmium Battery	25.92
32	201 ea.	20 ~~12.47~~	OPS/AU/A-1, Mobile Mtg. Bracket	13.18
33	40 ea.	21 ~~55.80~~	OPS/KA-8A, Telegraph module	61.13
34	10 ea.	23 ~~202.65~~	OPS/RU-6A, Two-way Repeater Kit	204.43
35	12 ea.	24 ~~32.12~~	OPS/TS-13A, Test Stand	37.15
36	25 ea.	25 ~~162.78~~	OPS/PA-20, RF Power Amplifier	171.10
37	50 ea.	26 ~~3.98~~	OPS/CT-2, External Battery Cable	4.50

Item	Quantity	GSA Contr. Item No.		Description	
38	256 ea.	31	~~6.13~~	OPS/HS-1, Headset	6.16
39	12 ea.	32	~~3.02~~	OPS/AU-25, Fuse holder	3.05
40	10 ea.	34	~~6.00~~	Ozalid Cct. Diagram for FM-1B	6.13
41	10 ea.	35	~~6.00~~	Ozalid Cct. Diagram for FM-5B	6.13
42	2 ea.	36	~~207.00~~	Spare Printed Circuit Board	211.00
43	200 ea.	37	~~6.00~~	Spare Crystals	8.94
44	10 ea.	40	~~133.73~~	OPS/TS-20, Test Set	135.13
45	52 ea.	41	225.00	Spares Kit for 10 FM-1B	225.00
46	55 ea.	42	350.00	Spares Kit for 10 FM-5B	350.00
47	21 ea.	43	113.00	Spares Kit for 10 PS/A-16	113.00
48	3 ea.	44	149.00	Spares Kit for 10 PA-20	149.00
	10		~~10.15~~	Instruction manual FM-1B	5.09
	10		12.65	Instruction manual FM-5B	8.60

VHF-FM BASE STATION

Item	Quantity	Description
149	3 ea.	VHF-FM Base Station with Remote Control Console in accordance with "OPS Standard Specifications for Radio Equipment" as set forth in Sections 1, 3 and 4 except as indicated below:
	2000	

a. Frequency Range: 148 to 174 MHz.

b. Number of Channels: Two-frequency transmit, two-frequency receive.

c. Operating Frequencies: to be supplied later.

d. Enclosure Type: Base station unit may be enclosed for floor or desk top mounting. Remote Control unit shall have desk top enclosure.

e. Power Source: 230 volts, 50 Hz.

f. Carrier RF Power Output: Minimum 60 watts.

g. Modulation: ± 15 KHz, wideband

h. Remote Control Console: To be capable of full operational control of transmitter/receiver over one or two telephone pairs up to 10 miles from the base station.

i. Clock: Numerical, electrical type, 230 volts, 50 Hz. to be furnished in remote control console.

Item	Quantity	Description
		j. Accessories: Desk type push-to-talk microphone.
		k. Other Requirements: The receiver shall be fully transistorized. The transmitter shall be fully transistorized with the possible exception of the power output and driver stages.
50	1 KT 900	Spare parts for Item 49 above, as recommended by the manufacturer for a two year period, but not to exceed 15% of the cost of Item 49.
51	14 ea. 800	VHF-FM Base Station constructed in accordance with "OPS Standard Specifications for Radio Equipment" as set forth in Sections 1 and 3 except as indicated below:
		a. Frequency Range: 148 to 174 MHz.
		b. Number of Channels: Two-frequency transmit, two-frequency receive.
		c. Operating Frequencies: to be supplier later.
		d. Enclosure Type: Desk top.
		e. Power Source: 230 volts, 50 Hz.
		f. Carrier RF Power Output: Minimum 25 watts.
		g. Modulation: ± 15 KHz, wideband

Item	Quantity	Description
		h. Clock: Numerical, electrical type, 230 volts, 50 Hz.
		i. Accessories: Desk type push-to-talk microphone.
		j. Other Requirements: The receiver shall be fully Transistorized the transmitter shall be fully transistorized with the possible exception of the power output and driver stages.
52	1 KT 1680	Spare parts for Item 51 above, as recommended by the manufacturer for a 2 year period, but not to exceed 15% of the cost of Item 51.
53	6 ea.	VHF-FM Motorcycle Station constructed in accordance with "OPS Standard Specifications for Radio Equipment" as set forth in Sections 1 and 7 except as indicated below:
		a. Mounting: Rear fender
		b. Frequency Range: 148 to 174 MHz.
		c. Number of Channels: Two
		d. Operating Frequencies: To be supplied later.
		e. Power Source: 12 VDC, neg. ground.
		f. Antenna Type: 1/4 wave whip, rear mount.
		g. Carrier RF Power Output: Minimum 6 watts.

Item	Quantity	Description
		h. Modulation: ± 15 KHz, wideband
		i. Other Requirements: The transmitter/ receiver unit shall be fully transistorized.
54	1 KT	Spare parts for Item 53 above, as recommended by the manufacturer, but not to exceed 15% of the cost of Item 53.
55	3 ea.	VHF/FM Monitor Receiver constructed in accordance with "OPS Standard Specifications for Radio Equipment" as set forth in Sections 1 and 3 except as indicated below:
		a. Frequency Range: 148 to 174 MHz.
		b. Number of Channels: Two
		c. Operating Frequencies: To be supplied later.
		d. Enclosure Type: Desk top.
		e. Power Source: 230 volts, 50 Hz.
		f. Signal Modulation: ± 15 KHz, wideband.
		g. Other Requirements: To be fully transistorized with built-in loudspeaker.
56	1 KT	Spare parts for Item 55 above, as recommended by the manufacturer for a 2 year period, but not to exceed 15% of the cost of Item 55.

Item	Quantity	Description
57	20 ea.	Antenna, VHF base station type.

a. Polarization: Vertical

b. Directional Characteristics: Omni-directional in azimuth, low angle in elevation.

c. Frequency range: 148 to 174 MHz.

d. Operating Frequency: To be supplied later.

e. Gain: Minimum 3DB

f. Power Input: 500watts

g. VSWR: Less than 1.5 to 1.

h. Impedance: 50 ohms

i. Connector: UHF female

j. Mounting: For tower or mast top.

k. Accessories: With mounting bracket for 1" to 2 7/8" O.D. pipe.

l. Hy-Gain 5/8 wavelength Model 731/732, or equal.

58	89 ea.	Antenna, VHF, mobile type.

a. Polarization: Vertical

b. Directional Characteristics: Omni-directional in azimuth, low angle in elevation.

Item	Quantity	Description
		c. Frequency Range: 148 to 174 MHz.
		d. Gain: Unity
		e. Mounting: Roof top
		f. Power Input: 250 watts
		g. VSWR: 1.5 to 1 maximum.
		h. Impedance: 50 ohms.
		i. Connector: Solderless connector for RG-58/U coaxial cable.
		j. Hy-Gain Model 703, or equal.
59	9 ea.	Battery charger, for charging automotive type lead-acid storage batteries.
		a. Output Voltage: 12 volts DC
		b. Output Current: 20 amperes.
		c. Power Source: 230 volts, 50 Hz, single phase.
		d. Other Features: To be provided with output voltmeter and output ammeter.
		e. La Marche Model A-40, or equal.

ANTENNA CONSTRUCTION MATERIAL

Item	Quantity	Description
60	20 ea.	Headset, C.F. Cannon type No. BA-2-2000 ohms, or equal.
61	20 ea.	Loudspeaker, communication type, Jensen No. AP-10 (ST590), or equal.
62	72 ea.	Telephone jack, Trimm Inc. type No. 90SN-02, or equal.
63	72 ea.	Telephone plug, Trimm Inc. type No. 511, or equal.
64	24 ea.	C.W. hand key, E.F. Johnson type 114-320, Allied Electronics Catalog No. 17B8920, or equal.
65	20 PG.	Insulator, 6", antenna feeder spreader type, package of 25, Daburn type No. 10-65, or equal.
66	500 ea.	Insulator, 12", antenna end type, Birnbach #471, or equal.
67	20 PG.	Insulator, lead-in, 10" rod/bushing, package of 10, Daburn type No. 10-237, or equal.
68	50 ea.	Antenna Tower, 40 feet, triangular cross section, rigid galvanized, guyed. Rohn Model 25G, or equal. Each tower shall consist of the following components: a. Three identical 10 foot tower sections. b. One 10 foot tower top section with upper end terminating in a mast support tube of 2¼" O.D.

$164

Item	Quantity	Description
		c. One hinged base plate to support the tower, to be secured by bolting to the tower foundation. Hinge to facilitate raising and lowering of the completely assembled 40 foot tower.
		d. Guy cable sufficient for at least six guys, three at the 20 foot level and three at the 40 foot level.
		e. Guy anchors, three, for setting in concrete base.
		f. Turnbuckles, "eye and jaw" type, at least six.
		g. Guy thimbles, at least 12, for use at each end of each guy cable.
		h. Cable clamps, at least 45, for securing guys and safety cables.
		i. Equalizer plates, three, for attaching guys to guy anchor rods.
		j. Ground rod, ground wire, and clamps for making secure electrical ground at the base of the tower.

Item	Quantity	Description
		k. Guying bracket assembly with torque bars, two, for attaching guys to tower.
		l. All necessary bolts, nuts, and other hardware for the assembly of the tower.
69	1 ea. #40	Erection fixture, gin pole, for Item 68, aluminum, Rohn Catalog No. EF-6-45, or equal.
70	100 ea. 6.75 each	Mast, 20 feet, guyed, 2 section, hot dipped steel construction with floating guy ring with hardware, Allied Electronics Catalog 11~~B~~A 2100ZW, or equal.
71	3 RO 10.95	Guy wire, No. 18 heavy duty, galvanized 1000 ft. per roll, Allied Electronics catalog 11~~E~~A 1563~~X~~W, or equal. 10.25
72	500 ea. .75	Ground rod, 4' X 3/8", complete with clamp and bolt, Allied Electronics catalog 11~~B~~A 2537~~X~~W, or equal. .75 1.12 newark 92F399
73	10 SL	Wire, Antenna, #12 stranded (7X20), silicon bronze, 500 feet per spool, Birnbach #524 or Daburn #2364/12, or equal.

Item	Quantity	Description
74	5 SL	Cable, 2 conductor #22 stranded, Chrome vinyl jacket, spiral shield, vinyl insulation, 1000 ft. per spool, Belden type 8737, Newark Electronics catalog 36F084, or equal.
75	5 SL	Cable, 2 conductor twisted pair, #12 stranded, jacketed, 1000 feet per spool, Belden type 8477, Newark Electronics Catalog 36F1354, or equal.

MISCELLANEOUS HAND TOOLS

	Item	Quantity	FSN No.	Description	
	76	22 ea.	3439-255-4571	Solder flux, 2 oz. can 26A 1578	0.15
	77	54 ea.	3439-273-3722	Solder rosin core, 1 lb. spool 26A 2112 or 26A 2164	2.14 2.82
	78	12 ea.	5210-293-3501	Tape measuring 100 ft. 26A 1185	6.90
34F180	79	10 ea.	5110-289-9657	Hacksaw, frame newark	4.00
	80	10 ea.	7125-641-5436	steel - doors - 5 shelves 36X18X78 Storage cabinets	15.00
	81	20 ea.	7340-721-6811	Electrician knife 26A 1424	1.49
	82	62 ea.	5140-331-5496	Box, tool, steel 26A 2149X	11.95
34F752	83	30 ea.	5120-293-0808	Extractor, 8" long electron tube pliers type .63	.98
	84	20 ea.	5120-223-9124	Hammer, carpenters, 1 lb. 26A1299	3.53
	85	10 ea.	5120-224-4082	Hammer, machinist, 3/4 lb, ball peen 26A1577	1.98
	86	10 ea.	5120-224-4047	Hammer, machinist 2 lb. ball peen 1.75	
	87	20 ea.	5110-234-1927	Chisel cold, steel 4" x 1/4" .14	
34F181	88	6 60 ea.	5110-223-5000	Blade, hacksaw 18 teeth, 10 in box 100 in box	12.00
	89	12 ea.	5110-698-7966	Masonry hand set drill set, steel holder, rubber grip, 6 points 3/16 to 1/2	6.70
	90	10 ea.	5110-595-8317	File set 14 pieces 6 half round 8" #-8" 1/6", 4 Taper 6"	9.00
	91	29 ea.	5110-293-3209	Pliers, diagonal 4½" 26A 2902	2.30
	92	29 ea.	5110-224-1532	Pliers diagonal 6" 26A 2904	2.57
	93	62 ea.	5120-756-1156	Pliers, lineman 8" 26A 2901	3.23
	94	62 ea.	5120-184-9403	Pliers, needle hose 6½" 26A 2910	2.25
	95	62 ea.	5120-223-7396	Pliers, standard nose 6" 26A2911	2.81
35F260	96	62 ea.	5120-277-4243	Pliers, lever jaw lock 7"	2.23
34F069	97	62 ea.	5120-224-7446	Punch, size #2 3/8"X4" ;20	.65
35F1424	98	62 ea.	5120-798-7357	handle w/3 bits Screwdriver clutch head set 2.00 store in handle 5/32 - 1/4	3.87
34F290	99	62 ea.	5120-240-8716	Screwdriver, cross tip 3" no 1	.78

	Item	Quantity	FSN No.	Description	
34F292	100	62 ea.	5120-234-8912	Screwdriver, cross tip 6"	1.35
	101	62 ea.	5120-988-6491	Screwdriver, flat tip 3 x 3/16" 26A3281	.66
	102	62 ea.	5120-988-6490	Screwdriver, flat tip 6 x 3/16" 26A3283	.81
34F258	103	62 ea.	5120-236-2104	Screwdriver, flat tip 10 x 9/64"	.69
34F218	104	62 ea.	5120-293-0314	Screwdriver, flat tip 10 x 1/2"	2.40
34F254	105	62 ea.	5120-227-7377	Screwdriver, flat tip pocket size magnetized 2 x 1/8" .09	.39
	106	62 ea.	5120-180-0705	Screwdriver, jewelers, .025	
	107	62 ea.	5120-180-0706	Screwdriver, jewelers, .040	
	108	62 ea.	5120-180-0727	Screwdriver, jewelers, .055	26A1384 2.89
	109	62 ea.	5120-180-0728	Screwdriver, jewelers, .070	
	110	62 ea.	5120-180-0729	Screwdriver, jewelers, .080	
34F774	111	62 ea.	5120-247-0868	Tweezers, 4 3/8" Type 2	1.17
34F339	112	28 ea.	5120-203-7064	Wrench, key set hex wrenches - 10, 1/16 to 3/8	6.75
	113	10 ea.	3439-618-6623	Soldering gun, 325 watt 26A2057	11.60
	114	10 ea.	5130-293-1846	Drill, electric 1/4" 26A1192	29.88
	115	10 ea.	5130-293-3456	Drill, electric 3/8" 26A1194	36.88
	116	10 ea.	6605-171-5121	Compass, magnetic	
	117	25 ea.	5133-293-0983	Drill set, 29 drills 1/16 to 1/2 in metal case. 26A2200	24.99
33F761	118	12 ea.	5110-293-0109	Chassis punch, 5/8"	2.70
33F762	119	12 ea.	5110-243-1645	Chassis punch, 3/4"	2.70
33F763	120	12 ea.	5110-293-0107	Chassis punch, 7/8"	2.70
33F764	121	12 ea.	5110-293-0108	Chassis punch, 1"	3.00

	Item	Quantity	FSN No.	Description	
33F766	122	12 ea.	5110-293-0105	Chassis punch, 1 1/8"	3.15
33F769	123	12 ea.	5110-293-0103	Chassis punch, 1 1/4"	3.15
	124	10 ea.	5120-293-1439	Machinists vise 26A2318X	21.55
	125	20 ea.	5133-449-6775	Drill set, 60 drills 26A3244	17.99
	126	10 ea.	3439-542-0531	Torch, Propane gas, Kit 26A1081	7.88
	127	10 ea.	5120-223-8455	Carrier, Storage Battery 17.5"	

TEST EQUIPMENT

Item	Quantity	Description
128	28 ea.	Volt-Ohm-Milliammeter, portable, complete with batteries, test leads, and carrying case with special transistorized polarity protection. 93.00 meter 12.60 case a. Sensitivity: DC, 20,000 ohms/volt. AC, 5,000 ohms/volt. b. Voltage ranges: 3 volts to 5000 volts in 6 ranges, AC and DC. c. DB meter ranges: -20 DB to + 75 DB in 7 ranges. d. Current ranges: 100 microamps to 10 amps in 5 ranges. e. Resistance ranges: 0 to 100 megohms in 4 ranges. f. Accuracy: DC - 2%, AC - 3% g. Triplett Model 630-PIK, Allied Electronics catalog 51B5299, or equal.
129	10 ea.	Voltmeter/Ohmmeter, vacuum tube type. 95.00 17.00 case a. DC Voltmeter Range: 0.5 to 1,500 volts in 8 ranges. b. AC Voltmeter Range: 4 to 4,000 volts in 7 ranges. c. Frequency Response of AC Voltmeter: 15 Hz to 3 MHz, ± 3%.

Item	Quantity	Description
		d. Input Impedance: 11 Megohms minimum. e. Ohmmeter Range: X1 to X100K in 6 ranges. f. Power Source: 115 volts, 50/60 Hz. g. Accessories: Complete with carrying case and test probes. h. Simpson Model 312, Allied Electronics catalog 51E9623, or equal.
130	10 ea. 11.75	RF Test Probe for Item 129 above (Voltmeter/Ohmmeter, vacuum tube type), to measure to 250 MHz, Simpson 0152, Allied Electronics catalog 51E9604, or equal.
131	9 ea. 200.00	Oscilloscope, 5", wideband, general purpose, with DC coupled amplifiers. a. Vertical Sensitivity: 100 millivolts per 0.25". b. Vertical frequency response: DC to 200 KHz. c. Vertical attenuator: 3 position compensated. d. Horizontal sweep: Adjustable, 5 Hz to 50 KHz in 4 steps. e. Horizontal sync provision: Internal or external.

Item	Quantity	Description
		f. Power Source: 115 volts, 50/60 Hz.
		g. Accessories: Test leads.
		h. Motorola model T-1015A, or equal.
132	1 ea.	Oscilloscope, 5", wideband, dual trace, capable of accepting various vertical deflection modules.
		a. Vertical sensitivity: 50 millivolts/cm minimum.
		b. Vertical frequency response: DC to 24 MHz.
		c. Horizontal sweep: Time base A: 24 preset calibrated sweep speeds from 0.1 microsecond/cm to 5 seconds/cm. In addition, uncalibrated, continuously variable to approx. 12.5 seconds/cm. Time base B: 18 preset calibrated sweep speeds from 2 microseconds/cm to 1 second/cm. In addition, sweep length continuously variable from 4 to 10 cm.
		d. Horizontal sweep expansion: Continuously variable to X5.
		e. Voltage calibrator: 0.2 mv to 100 v square wave in 18 calibrated steps.

Item	Quantity	Description
		f. Power requirements: 115 volts, 50/60 Hz. g. Accessories required: Connectors, probes, patch cords and adaptors. h. Tektronix Model 545B with CA plug-in-unit, or equal.
133	9 ea.	Transistor tester, automatic lead finding, in-circuit tester, for use where lead orientation is not known. Shall indicate presence of gain, shorts or opens. For testing power, switching, small signal, junction, alloy, and point contact types of transistors. Shall have GO-NO-GO type of indication with indicator lights (no meters). There shall be no knobs to adjust and no calibration required. The tester shall automatically self-adjust test voltages for silicon or germanium types. Power requirements: 115 volts, 50/60 Hz. Accessories require: clip leads and in-circuit test probe. American Electronic Laboratories Inc. (AEL) Model 240 with Model 242 in-circuit test probe, or equal.

425.00

Item	Quantity	Description
134	9 ea.	Wattmeter, RF Directional, insertion type, for measuring incident and reflected RF power flow in coaxial transmission lines under load conditions. The wattmeter shall consist of a line section, an indicating meter, and plug-in elements, all to be contained in a single case. A leather carrying case shall be furnished.

95100
200.00
17.50

a. Power rating: 1 watt to 1,000 watts (dependent on plug-in elements specified).

b. Frequency range: 2 to 1,000 MHz (dependent on plug-in elements specified).

c. Impedance: 50 ohms.

d. Insertion VSWR: 1.05 maximum

e. Meter accuracy: ± 5%

f. Meter scales: To permit direct reading of powers from one watt to 1,000 watts.

g. Connector type: UHF female.

h. Plug-in elements: Self-contained directional detectors calibrated for direct indication of RF power without the need of calibration charts or adjustments. The following plug-in elements shall be furnished:

1. 10 watts, 100 to 250 MHz.
2. 100 watts, 100 to 250 MHz.
3. 50 watts, 2 to 30 MHz.
4. 250 watts, 2 to 30 MHz.

Item	Quantity	Description
		i. Bird Electronics Corp. Model 43 Thruline RF Directional Wattmeter with selected plug-in elements and carrying case Model CC-1, or equal.
135	6 ea.	Load resistor, RF, coaxial.
	165.00	a. Power rating: 500 watts continuous b. Frequency range: DC to 1000 MHz c. VSWR: 1.1 maximum d. Impedance: 50 ohms e. Connector type: UHF f. Bird Electronics Corp. Model 8201, or equal.
136	1 ea.	Power Supply, DC
	278.00	a. DC output: 0 to 15 and 0 to 35 volts, DC b. AC output: 0 to 135 volts, AC c. Output current capacity: 30 amps continuous at 6 to 12 volts, DC. d. Power Requirements: 120 volts, 50/60 Hz. e. Regulation: 3 volt drop maximum from low current output to full load, 12 volt DC operation.

Item	Quantity	Description
		f. Other Features: To be equipped with front panel voltmeter, ammeter, variable voltage control and output terminals.
		g. Motorola Model T-1012A, or equal.
137	1 ea.	Ripple filter, for operation with DC power supply, Item ~~9~~ 136 above, up to 100 volts. The ripple filter shall be designed to reduce hum and ripple content to very low levels when servicing transistorized equipment. Shall be equipped with a switch to permit bypassing of the internal filter choke when desired. Motorola Model TEK 15A, or equal.
	50.00	
138	9 ea.	Signal Generator, FM, with continuously variable frequency range and frequency deviation controls, output attenuator, output level meter, and internal audio modulation oscillator.
	790.00	
	change to measurements model 804	
		a. Frequency Range: 25 to 54 MHz, 66 to 88 MHz and 132 to 175 MHz.
		b. Deviation Range: 0 to 15 KHz.

Item	Quantity	Description
		c. Frequency Dial Calibration Accuracy: ± 0.5% or better.
		d. Frequency Deviation Accuracy: ± 10% or better.
		e. Output Voltage: 0.1 to 100,000 microvolts
		f. Output Impedance: 50 ohms
		g. Modulation: 1,000 Hz. internal audio oscillator, and provision for external modulation.
		h. Power Source: 115 volts, 50 Hz
		i. Accessories: Output pad, 2 to 1 voltage ratio with UHF output connector. Output cable, 4 feet long, RG-55/U, to convert output to spaced binding posts. Output cable, 4 feet long, RG-8/U, to convert output to UHF connector.
		j. ~~Motorola Model T-1036A, Measurements Corporation Model 560~~ measurements model 804, or equal.
139	1 ea.	Signal generator, AM, providing continuous wave and amplitude modulated signal outputs.
		a. Frequency range: 50 KHz to 65 MHz.
		b. Frequency calibration accuracy: ± 1%
		c. Modulation: AM, 0 to 95%, 400 and 1000 Hz

Item	Quantity	Description
		d. Output voltage: Variable from 0.1 microvolt to 3 volts into 50 ohms.
		e. Harmonic output: At least 30 DB below carrier
		f. Power requirements: 115 volts, 50/60 Hz
		g. Accessories: 50 ohm termination adaptor, standard dummy antenna, and all necessary cables and connectors.
		h. Hewlett-Packard Model HP-606A, or equal.
140	2 ea.	Audio Oscillator, with continuously variable frequency and output level controls.
		a. Frequency range: 5Hz to 600 KHz in 5 ranges.
		b. Frequency dial accuracy: ± 2%
		c. Output: 10 volts into 600 ohms
		d. Distortion: ± 0.2% maximum
		e. Power requirements: 115 volts, 50/60 Hz
		f. Hewlett-Packard Model 200CD, or equal.
141	2 ea.	Voltmeter, electronic
		a. DC Voltmeter Range: ± 15 millivolts to ± 1,500 volts in 11 ranges.
		b. AC Voltmeter Range: 0.5 volts to 300 volts in 7 ranges.

Item	Quantity	Description
		c. Frequency Response of AC Voltmeter: 100 Hz to 100 MHz, ± 2%
		d. Frequency Range: 20 Hz to 700 MHz.
		e. Input Impedance: DC, 100 megohms nominal AC, 10 megohms nominal
		f. Ohmmeter Range: 10 ohms to 10 megohms, center scale, in 7 ranges ± 5%
		g. Power Supply: 230 volts, 50 Hz
		h. Accessories: AC probe, detachable power cord.
		i. Hewlett-Packard Model 410 C, or equal.
142	9 ea.	Signal generator, RF, providing continuous wave or amplitude modulated signal outputs.
		a. Frequency range: 20 Hz to 50 MHz
		b. Frequency calibration accuracy: 20 Hz to 200 KHz: ± 5% 80 KHz to 50 MHz: ± 1%
		c. Modulation: AM, 0 to 50%, variable from 20 Hz to 20 KHz, internal or external.

Item	Quantity	Description
		d. Output voltage and impedance: 20 Hz to 200 KHz: 0 to 50 volts across 7500 ohms 80 KHz to 50 MHz: 0.1 microvolt to 1 volt across 50 ohms
		e. Harmonic output: Less than 3% across the frequency range
		f. Power requirements: 115/230 volts, 50/60 Hz
		g. Output controls: Continuously variable RF attenuator with front panel output meter.
		h. Accessories: Output pad, 2 to 1 voltage ratio, with type UHF output jack. Output cable, 4 feet long, RG-55/U, with output at spaced binding posts. Output cable, 4 feet long, RG-8/U with type UHF output jack. Attenuator, ladder type, 6600 ohm input impedance, output voltage ratios of X1, X0.1 and X0.01 on open circuit, and X0.05 and X0.005 when terminated in 600 ohms. Output on spaced binding post.
		i. Measurements Corp. Model 82, or equal.

Item	Quantity	Description
143	2 ea.	Frequency and FM Deviation Meter, combined for use also as a signal generator, portable.

FM-10
306500

FM-93
16 1500

a. Frequency Range: 140 to 182 MHz.

b. Frequency Readout: Direct digital readout for frequency measurement or generation.

c. Accuracy: ± 0.0001%

d. Sensitivity for Frequency and Deviation Measurements:
2 millivolts

e. Deviation Ranges ± 15 KHz with 5% accuracy.

f. Beat Indicator: Built in audio amplifier and speaker: and visual meter indication.

g. Generator Output: 0.1 microvolt to 50 microvolts

h. Generator Modulation: Provision for external FM modulation.

i. Power Requirement: 115/230 volts. 50/60 Hz or 12 VDC

j. Accessories: Built-in battery charger and voltmeter, 6 ft. of 50 ohm coax-BNC to UHF, 12 volt power cord, 40 DB attenuator, 60 DB attenuator to allow direct coupling to transmitter, and rechargeable battery.

Item	Quantity	Description
		k. Other features: The unit shall be completely transistorized. Change to FM-10 ~~l. Gertsch Model FM-9E equipped with Models FC-4, RFA-60, and BPS-1, or equal.~~
144	1 ea.	Voltmeter/Ohmmeter, Electronic DC Multimeter type transistorized, portable, battery operated with test leads.
		a. Voltmeter Range: 100 millivolts to 1000 volts.
285.00		b. Voltmeter Accuracy: ± 3% of full scale
		c. Input Resistance: 10 megohms minimum
		d. Milliammeter Range: 1 microamp. to 300 milliamps
		e. Milliammeter Accuracy: ± 5% of full scale
		f. Ohmmeter Range: 0.2 ohms to 50 megohms.
		g. Ohmmeter Accuracy: ± 5% at center scale
		h. Power Requirements: Internal battery/ 115-230 VAC, 50/60 Hz
		i. Accessories: Internal battery RF probe to be supplied.
		j. Motorola Model 1063A equipped with SKN6009A and SLN 6055A, or equal.

Item	Quantity	Description
145	10 ea. 27.95	Lamp, fluorescent magnifier, 5" lens, 13" focus, spring controlled, counter balanced, adjustable arm, Swing-O-Lite Model BBM-9, Allied Electronics catalog 26E3175U, or equal.
146	1 ea. 45.00	Parts substitution assembly, with selectable functions for substituting various values of resistance, capacitance, and selenium/silicon rectifiers. All controls and parts assembled into single cabinet. Sencore, Inc., Addison, Illinois, Model RC 146, or equal. 45.00
147	10 ea. 8.95	Cabinet, steel frame, for small parts, 18 x 13 x 6", 48 drawers, Allied Electronics catalog 26B1975X, or equal. 8.95
148	29 ea. 26.85	Tool Kit, 23 piece in roll up kit, Xcelite Model 99SM, Allied Electronics catalog 26B1162, or equal.
149	18 ea. 9.95	Soldering Iron, 12 volts DC, 30 watts, Weller Model TCP-12, Allied Electronics catalog 26B2168, or equal. newark 33F369 9.95
150	40 ea. 8.69	Transformer, step down, 230 V to 115 V, 50 Hz, 150 VA, Allied Electronics catalog 54E2511, or equal. 8.69

Item	Quantity	Description	
151	40 ea. 11.30	Transformer, step down, 230 V to 115 V, 50 Hz, 250 VA, Allied Electronics catalog 54E2512, or equal.	11.30
152	4 ea. 31.66	Transformer, step down, 230 V to 115 V, 50 Hz, 1000 VA, Allied Electronics catalog 54 E 1432, or equal.	31.66
153	12 ea. 15.50	Transformer, step down, 230 V to 115 V, 50 Hz, 500 VA, Allied Electronics catalog 54E2513, or equal.	15.50
154	22 ea. 19.60	Transformer, step down, 230 V to 115 V, 50 Hz, 750 VA, Allied Electronics catalog 54E1434, or equal.	19.60

TELETYPE EQUIPMENT

Item	Quantity	Description
155	5 ea.	Page Printer Set, Send-Receive, with the following features:

a. Five level - 7.42 unit code

b. 8-1/2" width friction feed platen

c. Electrical signal line break mechanism

d. Repeat character mechanism

e. Unshift-on-space may be disabled if desired

f. Automatic carriage return and line feed

g. Signal bell on upper case "J"

h. Keyboard lock on "Blank-Blank"

i. Local carriage return and line feed mechanism

j. Margin indicator switch

k. Time delay motor stop mechanism

l. Single contact signal generator (includes spark and RF suppression)

m. 110 V 50/60 cycle series governed motor with gearing for 67 wpm (50 Baud)

n. Electrical service assembly with line shunt relay, electrical motor control relay, line relay, mounting, 120VDC 150 MA rectifier and cables to interconnect set components

Item	Quantity	Description
		o. Table model cabinet for housing set components (includes signal bell, copylight system and RF Suppressors for power and signal line leads) with gray smooth finish.
		p. Set shall be Teletype Corporation Model 28KSR, or equal.
156	1 ea.	Receiver Group, consisting of six receiver/typing reperforators in a single cabinet, with the following features:
		Typing Reperforator
		a. Five-level, 7.42 unit code
		b. 11/16" width chadless perforated tape output with printing over the Chad.
		c. CCITT No. 2 type wheel arrangement-AR.
		d. Standard Model 28 selector mechanism
		e. Remote control noninterfering "Letters" tape feed-out
		Multiple Typing Reperforator Base
		a. Provides mounting facilities for three typing reperforators, and a series-GOV.motor unit
		b. Finished in gray-green textured vinyl paint.

Item	Quantity	Description
		Motor Unit
		a. 115 V AC 50-60 cycle series-GOV. synchronous (drives three typing reperforators)
		Cabinet
		a. Provides mounting facilities for two multiple typing reperforator sets and the electrical control facilities to operate the sets.
		Additional Features
		a. Six typing reperforators with chadless perforated tape output
		b. Six reperforator monitor jacks
		c. Six mountings for line relays
		d. Six RY33 line relays
		e. Pull-out drawers with plexiglass windows for viewing reperforator operation.
		f. Two multigang reperforator bases with six tape supply reels
		g. Received tape holders for six channels
		h. 5.5 V AC transformer
		i. Two tape storage bins

Item	Quantity	Description
		j. Six message log holders
		k. Two 500 MA 120 V DC rectifier
		l. Six line relay shunts (mechanical)
		m. Typing reperforators are automatically removed from the signal circuit when an open line condition exists
		n. Six selector magnet switches for placing typing reperforators on local marking circuit
		o. Control or Alarm:
		1. Six white open-line indicating lamps
		2. Six amber remote control lamps
		3. One red low tape lamp
		4. Channel identification cards
		5. Six manual letters feed-out switches - letters noninterfering tape feed-out
		6. Provision for AC power failure alarm
		7. Provision for remote indication of low tape
		8. 115 V AC power receptacle
		9. Tape feed-out button
		10. Spare reperforator jack (to provide quick method of inserting a spare reperforator into the signal line)

Item	Quantity	Description
		11. Base on-off power switch 12. Main on-off power switch p. Finished in gray-green textured vinyl paint. Receiver Group shall be Teletype Corporation Model 28ROTR, or equal.
157	9 ea.	Send-Receive Set, Automatic, with the following features: a. Five-level, 7.42 unit code b. 8-1/2" width friction feed platen c. Signal bell on upper case "J" d. CCITT No. 2 type box, type wheel and keytop arrangement (includes blank keylever) e. Unshift-on-letters f. Typing perforator with 11/16" width, 5-level printed chadless tape output g. Tape backspace mechanism (Manual & Power Driven) h. Control switch for keyboard, keyboard and tape only operation i. Repeat character mechanism

Item	Quantity	Description
		j. Keyboard lock on "Blank-Blank"
		k. Keyboard with single contact signal generator (RF suppression filter)
		l. Electrical signal line break mechanism
		m. Local line feed and carriage return mechanism
		n. Automatic carriage return and line feed
		o. Electrical service assembly with line shunt relay, line relay mounting, motor control relay, 115V DC, 500 MA rectifier, line test key and cables to interconnect set components
		p. Two line relays
		q. Single contact (RF suppression filter) transmitter distributor for reading 5-level (11/16" width) chadless or fully perforated tape for on-line transmission of the 7.42 sequential start-stop code, end-of-tape and taut tape stop mechanisms, on/off switch with position to release the feed wheel and universal clutch magnet for either AC or DC operation.

Item	Quantity	Description

r. 115 V 50-60 cycle series-GOV. synchronous motor with drive parts for 67 words-per-minute operation (50 Bauds)

s. Auxiliary typing reperforator

1. 11/16" width printed chadless tape output
2. CCITT No. 2 typewheel arrangement with Bell on U/C "J"
3. Base with gear for 67 wpm operation
4. 115 V 50 cycle series-GOV. motor unit
5. Electrical service assembly with line shunt relay, signal bell assembly, 115 V DC 150 MA rectifier and line relay mounting.

t. Floor model console cabinet for housing set components (includes copylight system, signal bell and RF filters for power and signal line leads) with gray-green textured vinyl paint

u. Set shall be Teletype Corporation Model 28ASR, or equal.

Item	Quantity	Description
158	9 ea.	Send-Receive Set, Automatic, with the following features:

a. Five-level - 7.42 unit code

b. 8-1/2" width friction feed platen

c. Signal bell on upper case "J"

d. CCITT No. 2 type box, type wheel and keytop arrangement (includes blank keylever)

e. Unshift-on-letters

f. Typing perforator with 11/16" width, 5-level printed chadless tape output

g. Tape backspace mechanism (Manual & Power Driven)

h. Control switch for keyboard, keyboard and tape or tape only operation

i. Repeat character mechanism

j. Keyboard lock on "Blank-Blank"

k. Keyboard with single contact signal generator (RF suppression filter)

l. Electrical signal line break mechanism

m. Local line feed and carriage return mechanism

n. Automatic carriage return and line feed

Item	Quantity	Description
		o. Electrical service assembly with line shunt relay, line relay mounting, 120 V DC, 500 MA rectifier, line test key, motor control relay and cables to interconnect set components
		p. Line relay
		q. Single contact (RF suppression filter) transmitter-distributor for reading 5-level (11/16" width) chadless or fully perforated tape for on-line transmission of the 7.42 sequential start-stop code, end-of-tape and taut tape stop mechanism, on/off switch with position to release the feed wheel and universal clutch magnet for either AC or DC operation
		r. 110 V 50-60 cycle Series-GOV motor with drive parts for 67 words-per-minute operation. (50 Bauds)
		s. Floor model console cabinet for housing set components (includes copylight systems, signal bell and RF filters for power and signal line leads) with gray green textured vinyl paint

Item	Quantity	Description
		t. Set shall be Teletype Corporation Model 28ASR, or equal.
159	2 ea.	Page Printer Set, Receive-Only, with the following features:
		a. Five-level, 7.42 unit code
		b. 8-1/2" width friction feed platen
		c. Unshift-on-space may be disabled if desired
		d. Automatic carriage return and line feed
		e. Signal bell on upper case "J"
		f. CCITT No. 2 type box arrangement
		g. Time delay mechanical motor stop
		h. Electrical service assembly with line shunt relay, electrical motor control relay, line relay mounting, 120VDC 150 MA rectifier and cables to interconnect set components
		i. 110 V 50/60 cycle series governed motor with gearing for 50 Baud operation line relay

Item	Quantity	Description
		j. Table model cabinet for housing set components (includes signal bell, copylight system, margin indicator lamp, copy-holder, RF noise suppressor) with smooth light gray finish
		k. Set shall be Teletype Corporation Model 28RO, or equal
160	3 ea.	Transmitter Distributor Set, with the following features:
		a. Reads 5-level, 11/16" width chadless or fully perforated paper tape
		b. 7.42 Unit code sequential output
		c. End-of-tape and tight tape stop switches
		d. RF suppression
		e. Motor on/off switch
		f. Tape control switch-release, stop and run positions
		g. Spark protection network for transmitting contacts
		h. Universal clutch magnet - AC or DC

Item	Quantity	Description
		i. 110 V 50/60 cycle series governed motor with gears for 67 words-per-minute operation (50.0 Bauds) j. Double plate base with vibration mounts k. Customer provides signal and power line leads l. Cover in gray-green textured vinyl finish m. Set shall be Teletype Corporation Model 28 Tape Reader, or equal.
161	1 KT	Spare parts kit designed for field maintenance and repair of Items 155 through 160 above for a period of two years to consist of mechanical and electronic parts as recommended by the manufacturer, but not to exceed 15% of the cost of Items 155 through 160 above.
162	1 KT	Hand tool kit, designed for field maintenance and repair of Items 155 through 160 above, to consist of all non-standard special or unique tools as recommended by the manufacturer.

HF-SSB EQUIPMENT

Item	Quantity	Description
161	25 ea.	Receiver, HF-SSB, capable of reception on a minimum of four (4) crystal controlled channels.

a. Frequency Range: 2 to 15 MHz

b. Operating Frequencies: Crystals shall be furnished and the receiver shall be aligned for reception on the following frequencies: (To be supplied later)

Channel 1 -

Channel 2 -

Channel 3 -

Channel 4 -

c. Operating Modes: USB, LSB, AM and CW

d. Controls: Front panel controls shall include channel selector, volume, RF gain, mode selector, speech clarifier and power on-off.

e. Frequency Stability: ± 0.0001%

f. Sensitivity: 0.5 microvolt or better for 12 db SINAD at 50 milliwatts audio output

g. Selectivity: 2.3 KHz at 6 db down; 5.3 KHz at 60 db down.

h. Image Rejection: 45 db or greater

Item	Quantity	Description
		i. Spurious Response Rejection: 60 db or greater
		j. Audio Response: Not more than 6 db down at 470 and 2600 Hz
		k. Audio Output Power: 2 watts with less than 10% distortion
		l. Audio Outputs 600 ohm line output, loudspeaker output and headset output shall be provided
		m. Loudspeaker: A loudspeaker in a separate matching cabinet shall be provided
		n. Power Supply: 115/230 volts, 50 Hz, single phase
		o. Cabinet: Of the 25 units, 17 receivers shall be mounted in a 19 inch rack type desk top cabinet in such a way that the receiver may be removed for remounting on any standard 19 inch rack. 8 units shall be provided without a desk-top cabinet for direct mounting into a 19 inch rack.
		p. Other Characteristics: The receiver shall be of the double conversion type. Terminals shall be provided for an externally controled muting circuit. The antenna input shall be 50 ohms (nominal) provided through a UHF type coaxial connector.

Item	Quantity	Description
		q. Aerotron Model 9SR, Communications Associates, Inc. Model CR-17, or equal.
162	1 KT	Spare parts kit for field maintenance and repair of Item 161 above for a period of two years, as recommended by the manufacturer, but not to exceed 10% of the cost of Item 161 above.
163	25 ea.	Transmitter, HF-SSB, capable of transmission on a minimum of four (4) crystal controled channels. a. Frequency Range: 2 to 15 MHz b. Operating Frequencies: Crystals shall be furnished and the transmitter shall be aligned for transmission on the following frequencies: (To be supplied later) Channel 1 - Channel 2 - Channel 3 - Channel 4 - c. Operating Modes: USB, LSB, AM and CW

Item	Quantity	Description

d. Controls: All operating controls shall be located on the front panel of the unit to permit operation on all modes.

e. Frequency Stability: ± 0.0001%

f. RF Power Output: 100 watts PEP, minimum

g. Carrier Suppression: 50 db or greater

h. Unwanted Sideband Rejection: 45 db or greater below level of full output.

i. Inter-modulation Distortion Products: 30 db or greater.

j. Harmonic Suppression:

1. Second harmonic at least 40 db down from PEP output.

2. Third harmonic at least 50 db down from PEP output.

k. Audio Characteristics: Within ± 3 db from 350 to 3000 Hz.

l. Output Impedance: 50 ohms

m. Output Connector: Coaxial UHF connector

n. Duty Cycle: Continuous

Item	Quantity	Description
		o. Power Supply: 115/230 volts, 50 Hz, single phase.
		p. Cabinet: Of the 25 units, 17 transmitters shall be mounted in a 19 inch rack-type desk top cabinet in such a way that the transmitters may be removed for remounting on any standard 19 inch rack. 8 units shall be provided without a desk top cabinet for direct mounting into a 19 inch rack.
		q. Other Characteristics: The transmitter shall have provision for remote control and 600 ohm telephone patch. A desk type microphone, manual CW key, and all accessories shall be provided.
		r. Aerotron Model 90T150, Communications Associates, Inc., Model CT-50, or equal.
164	1 KT	Spare parts kit for field maintenance and repair of Item 163, above, for a period of two years, as recommended by the manufacturer, but not to exceed 10% of the cost of Item 163, above.
165	2 ea.	Receiver, HF, Communications type.
		a. Frequency Range: 2 to 30 MHz, continuously tuneable.
		b. Operating Modes: USB, LSB, AM and CW.

Item	Quantity	Description
		c. Frequency Stability: Within 100 Hz per week (at room temperature after 90 minute warmup).
		d. Sensitivity: SSB and CW
		2-30 MHz: 0.6 microvolts max. for 10 DB $\frac{S + N}{N}$
		0.5-2.0MHz: 3 microvolts max. for 10 DB $\frac{S + N}{N}$
		0.2-0.5 MHz: 4 microvolts max. for 10 DB $\frac{S + N}{N}$
		e. Selectivity:
		SSB - 2.4 KHz bandwidth at 3 DB points.
		CW - 800 Hz bandwidth at 3 DB points.
		AM - 5 KHz bandwidth at 3 DB points.
		f. AGC Characteristics: Audio output variation less than 6 DB for RF inputs from 5 to 50,000 microvolts. Not more than 3 DB change in audio output with RF inputs from 50,000 microvolts to 1 volt.
		h. RF Input Impedance: 50 ohms unbalanced.
		i. Image Rejection: Not less than 50 DB (from 2 to 30 MHz)
		j. Other Spurious Signal Rejection: Not less than 80 DB (from 2 to 30 MHz)

Item	Quantity	Description
		k. Audio Outputs: 4 ohms unbalanced, 600 ohms unbalanced, 600 ohms balanced.
		l. Audio Frequency Response: SSB - Within 3.5 DB, 300 to 2700 Hz AM - Within 6 DB, 200 to 2500 Hz
		m. BFO; Shall be crystal oscillator controled.
		n. Input-Output Meter: Shall be provided on the front panel.
		o. Power Requirement: 115/230 volts, 50/60 Hz.
		p. Cabinet: Receiver shall be mounted in a 19 inch rack type desk top cabinet in such a way that it may be removed for remounting in any standard 19 inch rack.
		q. Accessories: A loudspeaker unit in matching cabinet shall be provided.
		r. Collins Model 51-S-1, or equal.
166	1 KT	Spare parts kit for field maintenance and repair of Item 165 above for a period of two years, as recommended by the manufacturer, but not to exceed 10% of the cost of Item 165 above.

Item	Quantity	Description
167	2 ea.	Linear Amplifier, HF-SSB

a. Frequency Range: 2 to 15 MHz

b. Number of Channels: Four

c. Operating Modes: SSB, AM, and CW

d. RF Power Output: 1000 watts PEP

e. Duty Cycle: Continuous operation at full rated output

f. Drive Power: Not more than 75 watts PEP required for full SSB output.

g. Drive Unit: The linear amplifier must be fully compatible with the HF-SSB transmitter supplied under Item 162 above.

h. Power Requirement: 115/230 volts, 50/60 Hz. single phase.

i. Operating Frequencies: (To be supplied latter)

Channel 1 -

Channel 2 -

Channel 3 -

Channel 4 -

j. Communication Associates, Inc. Model CL-3A or equal.

Item	Quantity	Description
168	1 KT	Spare parts kit for field maintenance and repair of Item 167 above for a period of two years, as recommended by the manufacturer, but not to exceed 10% of the cost of Item 167 above.
169	1 ea.	Line Voltage Regulator, electronic-magnetic type. a. Output KVA: 10 KVA b. Input Voltage: 230 volts, 50 Hz (nominal), single phase. c. Output: 230 volts nominal, adjustable d. Voltage Regulation: Output within ± 1% for input voltage variation of ± 20% and input frequency variations of 47 to 53 Hz. e. Harmonic Distortion in Output: Less than 3%. f. Solatron catalog 32-21-310, or equal.
170	2 ea.	Line Voltage Regulator, electronic-magnetic type. a. Output KVA; 3 KVA b. Input Voltage: 230 volts, 50 Hz, (nominal), single phase.

Item	Quantity	Description
		c. Output: 230 volts nominal, adjustable d. Voltage Regulation: Output within ± 1% for input voltage variations of ± 20% and input frequency variations of 47 to 53 Hz. e. Harmonic Distortion in Output: Less than 3% f. Solatron catalog 32-21-230 or equal.
171	10 ea.	Line Voltage Regulator, electronic-magnetic type. a. Output KVA: 1 KVA b. Input Voltage: 230 volts, 50 Hz. (nominal), single phase. c. Output: 230 volts nominal, adjustable. d. Voltage Regulation: Output within ± 1% for input voltage variations of ± 20% and input frequency variations of 47 to 53 Hz. e. Harmonic Distortion in Output: Less than 3% f. Solatron catalog 32-21-210, or equal.
172	4 ea.	Cabinet Standard Rack Type, 19" panel, 77" panel height, steel, Bud type CR-2073, Allied Electronics catalog 42E7506L2Z, or equal.

CABLE AND CONNECTORS

Item	Quantity	Description
173	2 SL $111.00 each	Cable, Coaxial, 50 ohms, RG-8/U, in 1000 foot spool, Belden type 8237, Allied Electronics catalog 55E7262X, or equal.
174	1 SL .55/ft.	Transmission Line, RF, Coaxial, 50 ohms, 1/2 inch foam dielectric in 1000 foot spool. Andrews type FH4-50A, or equal.
175	20 ea. 5.50 each	Connector, UHF coaxial plug, to mate with SO-239A, Andrews type 44 AP, or equal.
176	20 ea. 5.50 each	Connector, UHF Coaxial jack, to mate with PL-259A, Andrews type 44 AU, or equal.
177	30 ea. .95 each	Connector, UHF Coaxial straight adapter, PL258, Allied Electronics catalog 47E0355, or equal.
178	100 ea. $4/each	Connector, UHF Coaxial plug, PL259, Allied Electronics catalog 47E0350, or equal.
179	20 ea. .55 each	Receptacle, UHF Coaxial, SO-239, Allied Electronics catalog 47E0352.

Item	Quantity	Description
180	50 ea. .15 each	Connector, UHF Coaxial reducing adapter, UG-175/U, Allied Electronics catalog 47E0360, or equal.
181	1 SL $42.60 / 1000 ft	Cable, Coaxial, 50 ohms, RG-58A/U, in 1000 foot spool, Belden type 8259, Allied Electronics catalog 55E7297U, or equal.

TRAINING AIDS

Item	Quantity	Description
182	15 ea.	Fundamentals Component Trainer, Laboratory aid to the study of Direct-Currents, Alternating Currents and Vacuum Tubes. Includes AC and DC power supplies, prewired jackfield, components and individual circuit templates for the following circuits:

Ohms Law
Resistors in Series
Resistors in Parallel
Resistors in Series-Parallel
Characteristics of Capacitors
Capacitors and R-C Circuits
Capacitors in Parallel
Capacitors in Series (A-C)
Capacitors in Series (D-C)
Inductors and R-L Circuits
Characteristics of Inductors
Inductors in Series
Inductors in Parallel
Mutual Inductance - The Transformer
Series Tuned Circuit

Item	Quantity	Description
		Parallel Tuned Circuit
		Vacuum Tube Characteristics
		Additional Tube Experiments
		Saturable Reactor
		Silicon Controled Rectifier
		Includes a comprehensive experiment guide with provisions for recording results.
		RCA Model 701-FD, or equal.
183	15 ea.	Transistor Trainer, Laboratory aid to the study of Transistor, Fundamentals and Radio Receiver circuits. Includes mercury batteries mounted inside the trainer and individual circuit templates for the following circuits:
		P-N Junctions
		Transistor Characterists
		Common Emitter Amplifier
		Common Base Amplifier
		Common Collector Amplifier
		Bias Stabilization
		Resistance-Coupled Amplifier
		Audio Amplifier

Item	Quantity	Description
		I-F Amplifier and Detector Oscillator-Converter Superheterodyne Receiver Free Running Multivibrator Includes a comprehensive experiment guide with provisions for recording results. RCA Model 701-T, or equal.
184	1 ea.	Composite Classroom Trainer. For demonstration and study of fundamental electrical and electronic principles, AM and FM radio receivers and transmitters, and transistors. Instructor's Manuals are included. RCA Model 161-B, or equal. The RCA Model 161-B is a composite of the following RCA Models: 161-FD, 161-AM, 161-FM, and 301-T.
185	5 ea.	Composite Laboratory Trainer. For student laboratory application of fundamental electrical and electronic principles, AM and FM radio receivers and transmitters and transistors. Student experiment guides are included. RCA Model 121-B, or equal. The RCA Model 121-B is a composite of the following RCA Models: 121-AM, 121-FM, 701-FD and 701-T.

Item	Quantity	Description
186	15 ea.	Volt-Ohm-Milliammeter Dynamic Demonstrator Kit RCA Model WE-95A (K) or equal.
187	1 SE	Electronic Trainer Classroom Wall Charts for use with Composite Classroom Trainer, Item 184 above.
188	15 ea.	Programmed Instruction Lessons for use with the above equipment. Items 182 through 185.
189	5 ea.	Signal Generator, RF, providing continuous wave or amplitude modulated signal outputs. a. Frequency Range: 85 KHz to 40 MHz. b. Crystal Calibrator: Built-in crystal calibrating oscillator circuit with front panel crystal socket. c. Modulation: 400 Hz internal, with separate audio output. d. Power Source: 115 volts, 50 Hz. e. RCA Model WR-50 B, or equal.

Item	Quantity	Description
190	5 ea.	Signal Generator, Audio, with sine/square wave output. a. Frequency Range: 20 Hz to 200 KHz. b. Distortion: Less than 0.5%. c. Stability: Output amplitude variation not more than ± 1.5 DB. d. Power Source: 115 volts, 50 Hz. e. RCA Model WA-44C, or equal.
191	1 ea.	Tube and Transistor Tester, for testing mutual conductance, interelectrode leakage, shorts, gas and filament continuity of all current tube types. a. Mutual Conductance Ranges: 0 to 15,000 micromhos in 3 or more ranges. b. Power Requirements: 115 volts, 50/60 Hz. c. Accessories: Built-in roll chart. d. Hiekok Model 6000A, Allied Electronics catalog 51E5006U, or equal.
192	5 ea.	Volt-Ohm-Milliammeter, portable, complete with batteries, test leads, and carrying case with special transistorized polarity protection. a. Sensitivity: DC, 20,000 ohms/volt. AC, 5,000 ohms/volt

Item	Quantity	Description
		b. Voltage ranges: 3 volts to 5000 volts in 6 ranges, AC and DC.
		c. DB meter ranges: -20 DB to + 75 DB in 7 ranges.
		d. Current ranges: 100 microamps to 10 amps in 5 ranges.
		e. Resistance ranges: 0 to 100 megohms in 4 ranges.
		f. Accuracy: DC - 2%, AC - 3%.
		g. Triplett Model 630-PLK, Allied Electronics catalog 51E5299, or equal.
193	5 ea.	Voltmeter/Ohmmeter, vacuum tube type.
		a. DC Voltmeter Range: 0.5 to 1,500 volts in 8 ranges.
		b. AC Voltmeter Range: 4 to 4,000 volts in 7 ranges.
		c. Frequency Response of AC Voltmeter: 15 Hz to 3 MHz ± 3%.
		d. Input Impedance: 11 Megohms minimum
		e. Ohmmeter Range: X1 to X100K in 6 ranges.
		f. Power Source: 115 volts, 50/60 Hz.

Item	Quantity	Description
		g. Accessories: Complete with carrying case and test probes.
		h. Simpson Model 312, Allied Electronics catalog 51E9623, or equal.
194	5 ea.	RF Test Probe for Item 193 above (Voltmeter/ Ohmeter, vacuum tube type), to measure to 250 MHz, Simpson 0152, Allied Electronics catalog 51E9604, or equal.
195	1 ea.	Oscilloscope, 5", wideband, general purpose, with DC coupled amplifiers.
		a. Vertical Sensitivity: 100 millivolts per 0.25"
		b. Vertical frequency response: DC to 200 KHz
		c. Vertical attenuator: 3 position compensated
		d. Horizontal sweep: Adjustable, 5 Hz to 50 KHz in 4 steps.
		e. Horizontal syne provision: Internal or external.
		f. Power Source: 115 volts, 50/60 Hz

Item	Quantity	Description
		g. Accessories: Test leads.
		h. Motorola model T-1015A, or equal.
196	1 ea.	Transistor tester, automatic lead finding, in-circuit tester, for use where lead orientation is not known. Shall indicate presence of gain, shorts or opens, for testing power, switching, small signal, junction, alloy, and point contact types of transistors. Shall have GO-NO-GO type of indication with indicator lights (no meters). There shall be no knobs to adjust and no calibration required. The tester shall automatically self-adjust test voltages for silicon or germanium types. Power requirements: 115 volts, 50/60 Hz. Accessories required: clip leads and in-circuit test probe. American Electronic Laboratories Inc. (AEL) Model 240 with Model 242 in-circuit test probe, or equal.
197	1 ea.	Wattmeter, RF Directional, insertion type, for measuring incident and reflected RF power flow in coaxial transmission lines under load conditions. The wattmeter shall consist of a line section, an indicating meter, and plug-in elements, all to be contained in a single case.

Item	Quantity	Description
		A leather carrying case shall be furnished.
		a. Power rating: 1 watt to 1,000 watts (dependent on plug-in elements specified).
		b. Frequency range: 2 to 1,000 MHz (dependent on plug-in elements specified).
		c. Impedance: 50 ohms.
		d. Insertion VSWR: 1.05 maximum
		e. Meter accuracy: ± 5%
		f. Meter scales: To permit direct reading of powers from one watt to 1,000 watts.
		g. Connector type: UHF female.
		h. Plug-in elements: Self-contained directional detectors calibrated for direct indication of RF power without the need of calibration charts or adjustments. The following plug-in elements shall be furnished:
		1. 10 watts, 100 to 250 MHz.
		2. 100 watts, 100 to 250 MHz.
		3. 50 watts, 2 to 30 MHz.
		4. 250 watts, 2 to 30 MHz.
		i. Bird Electronics Corp. Model 43 Thruline RF Directional Wattmeter with selected plug-in elements and carrying case Model CC-1, or equal.

Item	Quantity	Description
198	1 ea.	Load resistor, RF, coaxial.
		a. Power rating: 500 watts continuous.
		b. Frequency range: DC to 1000 MHz.
		c. VSWR: 1.1 maximum
		d. Impedance: 50 ohms.
		e. Connector type: UHF
		f. Bird Electronics Corp. Model 8201, or equal
199	1 ea.	Power Supply, DC.
		a. DC output: 0 to 15 and 0 to 35 volts, DC.
		b. AC output: 0 to 135 volts, AC
		c. Output current capacity: 30 amps continuous at 6 to 12 volts, DC
		d. Power Requirements: 120 volts, 50/60 Hz
		e. Regulation: 3 volt drop maximum from low current output to full load, 12 volt DC operation.
		f. Other Features: To be equipped with front panel voltmeter, ammeter, variable voltage control and output terminals.
		g. Motorola Model T-1012A, or equal.

Item	Quantity	Description
200	1 ea.	Ripple filter, for operation with DC power supply, Item 190 above, up to 100 volts. The ripple filter shall be designed to reduce hum and ripple content to very low levels when servicing transistorized equipment. Shall be equipped with a switch to permit bypassing of the internal filter choke when desired. Motorola Model TEK 15A, or equal.
201	1 ea	Signal Generator, FM, with continuously variable frequency range and frequency deviation controls, output attenuator, output level meter, and internal audio modulation oscillator. a. Frequency Range: 25 to 54 MHz., 66 to 88 MHz. and 132 to 175 MHz. b. Deviation Range: 0 to 15 KHz. c. Frequency Dial Calibration Accuracy: ± 0.5% or better. d. Frequency Deviation Accuracy: ± 10% or better.

Item	Quantity	Description
		e. Output Voltage: 0.1 to 100,000 microvolts f. Output Impedance: 50 ohms g. Modulation: 1,000 Hz. internal audio oscillator, and provision for external modulation. h. Power Source: 115 volts, 50 Hz i. Accessories: Output pad, 2 to 1 voltage ratio with UHF output connector. Output cable 4 feet long, RG-55/U, to convert output to spaced binding posts. Output cable, 4 feet long, RG-8/U, to convert output to UHF connector. j. Motorola Model T-1036A, Measurements Corporation Model 560, or equal.
202	15 ea.	Tool kit, 23 piece in roll up kit, Xcelite Model 99SM, Allied Electronics catalog 26B1162, or equal.
203	15 ea.	FSN 3439-618-6623, Soldering gun, 325 watt.
204	15 ea.	FSN 3439-294-9009, Soldering iron, pencil shape.

Item	Quantity	Description
205	1 ea.	Test Set for OPS/FM-1B/5B, Hallicrafters OPS/TS-20.
206	15 ea.	Transformer, step down, 230V to 115V, 50 Hz, 150 VA, Allied Electronics catalog 54E2511, or equal.
207	35 ea.	Transformer, step down, 230 V to 115 V, 50 Hz, 250 VA, Allied Electronics catalog 54E2512, or equal.
208	15 ea.	Transformer, step down, 230 V to 115 V, 50 Hz, 500 VA, Allied Electronics catalog 54E2513, or equal.
209	6 ea.	Transformer, step down, 230 V to 115 V, 50 Hz. 1000 VA, Allied Electronics Catalog 54E1432, or equal.
210	1 ea.	Classroom Training Set, Telegraph Operator, for classroom training of up to 30 students in receiving and sending hand keyed radio telegraph signals. The training set shall consist of the following:

Item	Quantity	Description
		(a) Keyer, automatic, for reproduction of audible code signals from standard Wheatstone perforated tape. One unit.
		1. Code speeds adjustable from 4 to 30 WPM shall be provided. The indicated speed shall be maintained within 5%.
		2. The Keyer shall be supplied with 3 reels of perforated tape mounted on 400 foot, 7 inch reels. One additional empty reel shall be provided.
		3. Each reel of tape will contain alphabetical and numerical code groups in sufficient amount to supply code signals for 1 1/2 hours at a speed of 20 WPM.
		4. The audio output of the keyer shall be free from drift, chirp, or thump.
		5. Power output of the keyer shall be sufficient to drive up to 500 pairs of high impedance headphones.
		6. Output impedance of the keyer shall be 16 ohms. The audio tone shall be variable from 200 to 2000 Hz.

Item	Quantity	Description
		7. Facilities shall be provided in the keyer for automatic take-up and electric rewinding of the tape.
		8. The keyer shall be constructed so that a tape life of at least 500 passes may be achieved without damage to the tape.
		9. The keyer shall be constructed for ease of insertion and removal of code tape reels.
		10. Audio output jacks shall be provided for distribution of audio to the classroom positions as well as for monitoring at the keyer.
		11. A monitor speaker with on-off switch shall be provided in the keyer.
		12. A tone source shall be included in the keyer for powering hand keyed audio. A jack for local use of a hand key shall be provided.
		13. Volume and tone controls shall be provided on the front panel.
		14. All electronic circuitry in the keyer shall be solid state.
		15. Appropriate operating spares, including fuses, belts and items of wear shall be provided and stored in the keyer.

Item	Quantity	Description
		16. The keyer shall be mounted in a steel cabinet for desk top mounting.
		(b) Distribution Panel, with provisions for instructor sending, instructor monitoring, switching of keyer to various groups of students, for switching of audio tone output to various groups of students, and for distribution of other audio signals such as radio and phonograph outputs. The panel shall be mounted in a steel cabinet for desk top mounting. A coded terminal board shall be provided for interconnecting leads to keyer, tone sources, other audio sources, and distribution of audio signals and keying circuit to student positions. One unit.
		(c) Student Position Terminal Box, with jacks for hand key and headphones. A terminal strip shall be provided for interconnecting leads. 30 units.
		(d) Headphones, 600 ohms, heavy duty, complete with cable and plug. 30 units.

Item	Quantity	Description
		(e) Key, hand, heavy duty, adjustable bearings, silver contacts. 15 units.
		(f) Phone plug for use with hand key. 15 units.
		(g) Power Source: 230 watts, 50 Hz.
		(h) Diagram, detailed, for the set-up of the above equipment in the classroom, with complete Keyer instruction manual.
		(i) ATKO Automatic Telegraph Keyer Corp., (275 Madison Avenue, New York, N.Y. or equal)
211	1 ea.	Projector, Overhead type.
		a. Projection Aperture: 10" x 10"
		b. Projection Lamp: 500 watt standard type. To be equipped with 2 extra lamps.
		c. Construction: Metal base, aluminum top. All mechanical and optical components to be mounted on top aperture plate.
		d. Power Source: 115 volts, 50 Hz with 15 foot 3 wire cord.
		e. Brodhead - Garrett Catalog Model 900F, or equal.

Item	Quantity	Description
212	1 SE	Transparencies, Instructional, 8 1/2" X 11", set of 104, DCA Instructional Transparencies on Electricity and Electronics (page 828 of Brodhead-Garrett catalog).
		NOTE: Items 213 through 232 below books may be purchased from Brodhead-Garrett, Cleveland, Ohio
213	1 ea.	UNDERSTANDING ELECTRICITY AND ELECTRONICS, by Buban & Schmidt
214	1 ea.	GENERAL ELECTRICITY, by Jones
215	1 ea.	GENERAL SHOP ELECTRICITY, by Dragoo & Porter
216	1 ea.	ELECTRICITY AND ELECTRONICS-BASIC, by Walter B. Steinberg & William B. Ford
217	1 ea.	MODERN DICTIONARY OF ELECTRONICS, by Rudolf F. Graf
218	1 ea.	EXPERIMENTAL BASIC ELECTRONICS, by Evans & Porter
219	1 ea.	PROJECTS IN ELECTRICITY, by Collings
220	1 ea.	ELECTRICITY, by Howard H. Gerrish
221	1 ea.	ELECTRONICS, by Howard H. Gerrish
222	1 ea.	ELECTRICITY AND ELECTRONICS, by Howard H. Gerrish
223	1 ea.	ELECTRICITY ONE-SEVEN, by Harry Mileaf

Item	Quantity	Description
224	1 ea.	ELECTRONICS ONE-SEVEN, by Harry Mileaf
225	1 ea.	PROGRAMMED BASIC ELECTRICITY COURSE
226	1 ea.	ABC'S OF ELECTRICITY, by the Howard W. Sams Editorial Staff
227	1 ea.	SCIENCE PROJECTS IN ELECTRICITY, by Edward M. Noll
228	1 ea.	SCIENCE PROJECTS IN ELECTRONICS, by Edward M. Noll
229	1 ea.	ELECTRONICS EXPERIMENTS & PROJECTS, by Len Buckwalter
230	1 ea.	BASIC ELECTRICITY-3rd Edition - LABORATORY MANUAL, by Zbar & Schilakraut
231	1 ea.	BASIC ELECTRONICS-LABORATORY MANUAL, by Zbar & Schilakraut
232	1 ea.	BASIC RADIO AND RADIO-RECEIVER SERVICING-LABORATORY MANUAL, by Zbar & Schilakraut

VHF MULTIPLEX TERMINALS

Item	Quantity	Description
233		Multichannel VHF-FM radio/multiplex transmitter system and associated equipment for remote HF radio station control and operation, fully assembled, wired and tested as a system consisting of the following major items. Following manufacturers part numbers are given to indicate the type and quality of equipment required. Other manufacturers equipment may be substituted provided it meets the general specifications and performance criteria of equipment listed:
	2 ea.	Farinon PT-300 60B5 Transmitter 20 watt output, 220 VAC 50 cycle crystaled to 236.5 MHz
	1 ea.	Type 10143 XMTR auto-transfer panel list 1, 4
	1 ea.	Type 10308 List 1, 7' Relay Rack
	2 ea.	Type 10153 Jackfield Mounting Strip, wired for (AF, DC, tests)
	1 ea.	Type 10515-M2 Service Channel Panel List 1, 6 w/o telephone handset hookswitch
	1 ea.	Type 11521 48 VDC Service Channel Power Supply
	1 ea.	Type 11492 Circuit Breaker Panel List
	1 ea.	Type 12150 Terminal Block Panel, List 1
	1 ea.	Type 11193 LD-1 Multiplex Equipment Shelf

Item	Quantity	Description
	2 ea.	Type 11197 LD-1 Channel XMT Unit (Channel 1 & 2)
	1 ea.	Type 11205 AC Power Supply
	1 ea.	Type 11412 Line Equipment unit
	2 ea.	11199 Channel Signal Unit (Syne XMT only) (wiring to be provided for future channels 3 & 4)
	1 ea.	Meter Panel w/VU and DC meters and test jacks
	2 ea.	Quindar QX-11 Frames
	11 ea.	Quindar QT-30-1 Tone Transmitter (Direct Baseband)
	11 ea.	Quindar QTL7 Loop units (220V 50 cycle)
	1 ea.	Quindar QM-20 Test meter
	1 ea.	Quindar QUE-5 extension module
	1 LT	Antenna/Transmission line kit
	1 RO	150' Foam Heliax Line 1/2" type FH-4-50 w/Andrew Type 44 AW (N-type) plugs
	1 ea.	Yogi Antenna Scala type CA-5-450 w/mounts
	2 ea.	Antenna Plugs Andrew Type 44 AW (loose)
	1 ea.	Type 12395-1 Wraplock kit
	1 ea.	Type 26892-1 Gronding kit
	1 LT	Radio/Multiplex/Tone Unit spare parts kit including 100% replacement tubes, transistors, diodes lamps, fuses, relays and other critical consumable spares not to exceed 15% of net equipment cost.

Item	Quantity	Description
	1 LT	Jackfield Connector Cords
234		Multichannel VHF-FM radio/multiplex receiver system and associated equipment for HF radio station control and operation, fully assembled, wired and tested as a system and consisting of the following major items. Following manufacturers part numbers are given to indicate the type and quality of equipment required. Other manufacturers equipment may be substituted provided it meets the general specifications and performance criteria of equipment listed:
	2 ea.	Farinon PT-300-60B5 Receiver (216-328 MHz) w/Regulated 220 VAC 50 cycle, power supply
	1 ea.	Type 10393 Cembiner (Receiver Only)
	1 ea.	Type 12367 Power Divider
	2 ea.	Type 10153 Jackfield Mounting Strip
	1 ea.	Type 10308 (Wired for AF, DC, tests) 7' relay rack
	1 ea.	Type 11521 DC Cembiner Power Supply
	1 ea.	Type 11492 Circuit Breaker Panel List 2
	1 ea.	Type 12150 Terminal Block Panel list 1
	1 ea.	Meter Panel w/VU and DC meters and test jacks

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Item	Quantity	Description
	1 ea.	Type 11193 LO-1 Multiplex Equipment Shelf
	1 ea.	Type 11205 AC Power Supply 220 VAC
	1 ea.	Type 11412 Line Equipment unit
	2 ea.	Type 11198 Channel Receive Units (Channel 1, 2) List 1, 2, 4
	2 ea.	Type 11199 Channel Signal Unit (Channel 1, 2) Syne RCV only (wiring to be provided for future channels 3 and 4).
	2 ea.	Quindar QX-11 Frames
	11 ea.	Quindar QR 30 Tine Receiver (Direct Baseboard)
	11 ea.	Quindar QTL 8 Loop Units (220 VAC, 50 cycles)
	1 ea.	Quindar QM-20 Test Set
	1 ea.	Quindar QE-5 extension module
	1 LT	Antenna/Transmission Line Kit (Same as for other terminal)
	1 LT	Jackfield Connector Cords
	1 LT	Radio/Multiplex/Tone Unit Spare Parts Kit for Transmitter Terminal

TELETYPE PAPER

UNCLASSIFIED

Item	Quantity	Description
235	3000 RL	Teletype Paper 8 1/2 inches wide, Carbon interleaved in rolls. 2 copy (3 ply) canary original and one white sheet GSA Federal Supply No. 7530-223-7969
236	100 CT	Teletype Tape 11/16" width 8" diameter roll. Color white GSA Federal Supply No. 7530-273-9704

UNCLASSIFIED