12

POLICY AND REGULATIONS

FOR

FIXED SIGNAL SERVICES

IN CANADA

~~SECRET~~

Issued by the
Director of Signals (Army)
under the direction of
The Chief of The General Staff
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POLICY AND REGULATIONS

for

FIXED SIGNAL SERVICES IN CANADA

PART ONE

GENERAL

Section I.—General Considerations.

Section II.—Purpose and Classification of Fixed Signal Services.

Section III.—Control and Duties of F.S.S. Signal Officers.

Section IV.—F.S.S. responsibilities of R.C. Signals.

SECTION I. (General Considerations)

1. The object of this pamphlet is to provide a summary of the general practices of Fixed Signal Services as it applies in Canada. This pamphlet in no way supersedes Signal Training Vol. VI, Fixed Signal Services, but rather clarifies the situation with regard to its application in Canada, where local conditions and communication practices vary considerably from those in use in Great Britain.

2. While it is neither possible nor desirable to lay down hard and fast rules to govern provision of Fixed Signal Services, as the requirements of other arms and the conditions in which the signal services are employed vary considerably in different Commands or Districts, the principles enunciated in Signal Training Vol. VI, together with this publication are generally applicable to all Commands or Districts and should only be departed from when the Signal Officer responsible is satisfied that special local circumstances demand it. N.D.H.Q. authority will be necessary if large scale deviations are proposed.

3. This publication omits, as far as possible, references to technical details which are at present covered in other volumes of Signal Training.

4.-5.

SECTION II. (Purpose and Classification of F.S.S.)

6. The purpose for which Fixed Signal Services are required can be generally listed as follows:—

(a) Operation of Defences of all types, including both Coast Defence and AA Communications.

(b) Administration, which includes the administrative signal requirements for all fixed defences, administrative Headquarters and Establishments.

(c) Training in Fixed Training Camps or Areas, including all communications installed on a permanent or semi-permanent basis for Training Centres. Any formations or units using these training centres and providing their own temporary communications will not be permitted to connect with the Training Centre permanent system without the consent of the responsible Signal Officer—i.e. the Chief Signal Officer, District Signal Officer or Camp Signal Officer whichever applies.

7.-8.-9.

SECTION III. (Control and Duties of Signal Officers)

10. The Director of Signals is responsible to the CGS for all signal matters including the following:—

(a) Fixed Signal Services Operational Policy, Construction and Operating practices.

(b) Fixed Signal Services Commercial and Traffic Policy, and control of rented or leased telephone or teletype facilities.

(c) Line Maintenance.

(d) First Echelon Equipment maintenance.

11. The CSO is the technical advisor to the GOC-in-C on all signal matters, including fixed signal services (close liaison being maintained with Colonel, Fixed Defences). The following functions come directly within his scope:—

(a) Member of the Joint Service Sub-Committee, Signals.

(b) Technical Examination of all communication estimates and recommendations.

(c) Preparation of Submissions to NDHQ for all Fixed Signal Services.

(d) Arrangements for lease of operational and administrative communication facilities from civil sources and recording of same.

(e) Co-operation with Navy Signals, Air Signals, and Civil Communication Companies.

(f) Policy of Maintenance of FSS outlined in para. 10(c) and 10(d) above.

12. The following duties are also covered by personnel on the staff of the CSO:—

(a) Engineering detail with respect to Outside Plant Construction such as —aerial cable, buried cable, submarine cable and open wire.

(b) Engineering detail with respect to Inside Plant which includes FSS equipment, drop wire, conduit layouts, etc.

(c) Detail work on estimates for all types of telephone plant.

(d) Preparation of purchase orders for construction materials and control of expenditures relating thereto.

(e) Inspection and surveys of FSS plant as required.

13. Command or Area Signal Companies or sections thereof are located in each Fortress or Defended Area (Port) and the responsible Signals Officer in each case is the technical advisor to the Fortress or Area Commander on all matters affecting Fixed Signal Services. He is also responsible for the execution of all such services as are authorized. He will prepare initial estimates for submission to Command Headquarters (through District Headquarters where applicable)*.

*(The R.C. Signals organization differs in the Commands as follows:—(a) One Command may have a CSO at Command HQ and an Area Signal Company for each Fortress or Defended Area; (b) Another Command may have a CSO and an OC Command Signals at Command HQ and a Command Signal Company or Section in each of the Fortress or Defended Areas. The Commanding Officer of a Command Signal Company may be required to perform the duties of a Force or District Signal Officer in addition to his responsibilities as OC Command Signal Company. This particularly applies where a District HQ is located within a Fortress or Defended Area. For purposes of reference throughout this publication the Officer Commanding a Command Signal Company or Section will be referred to as a **Command Signal Officer** and the Officer Commanding an Area Signal Company as an **Area Signals Officer.**)

14. **The District Signal Officer** is the technical advisor to the District Officer Commanding on all signal matters, including Fixed Signal Services. The DSO is responsible to the DOC for:—

(a) Supervising and controlling all Fixed Signal Services carried out in the District.

(b) The control of all Army owned or leased communications plant and the transactions involving the same.

(c) The efficient and economic design and installation of communication facilities, recommended or approved by him, and that estimates approximate or detailed, submitted by him, are adequate for carrying out the services specified.

(d) Furnishing full reports on the engineering aspects of such questions as may be submitted to him, and, at the same time, ensuring that where other arms or services are affected, their views are taken into consideration in his recommendations.

(e) Advising the DOC as required in matters pertaining to Signals Training within the District.

15. The DSO must make himself acquainted with all details of leased or Army owned communication facilities within his District. He should also acquire a knowledge of all Civil Communication Systems within his District which may be important from a military point of view. The DSO is responsible for the proper conduct of business in RC Sigs. offices, seeing that funds authorized for Signal Services are expended economically, and seeing that books and records are properly maintained. (Within a Command the DSO's are only responsible for such funds as are authorized for rentals and local purchases.)

16.-17.

SECTION IV. (F.S.S. Responsibilities of R.C. Signals)

18. The responsibilities of R.C. Signals in connection with Fixed Signal Services provision, installation and maintenance are as follows:—

(a) **Navy**

(i) The Army will provide, install and maintain such operational or administrative communication facilities as Naval Services require in the various Fortresses or Defended Areas. These requirements are governed by War Office policy modified by Naval Authorities to meet conditions peculiar to a certain area. As a general rule the above requirements can be taken care of in the extensive communication plant provided for Coast Defence or A.A. Defence. Where it is necessary to lay a special cable or erect extensive facilities to meet naval requirements only, the CSO will require **specific approval of Naval Services Headquarters** in order to support his demand for F.S.S. equipment and funds for required construction material.

(ii) The administrative communications referred to in sub para. (a) (i) applies only to remote naval stations which cannot be economically served from commercial facilities or in **Minor Defended Areas** where it is more economical for the Army to provide all administrative facilities. In the latter case approval must be obtained from Naval Services in the same manner as other joint services projects, i.e. through the Joint Services Sub-Committee (Signals).

(b) **R.C.A.F.**

(i) The Army will provide, install and maintain such operational facilities as are required for the Defence of an Airport and which is classified as an Army commitment, i.e. A.A. Defence, etc.

(ii) Provision will also be made in the Coast Defence or A.A. Defence communication networks to include such circuits as are desired by R.C.A.F. for operational or administrative requirements.

(iii) As in the case of Naval Services, Administrative requirements apply only to remote areas not cared for by R.C.A.F. and Minor Defended Areas where it is jointly agreed that the Army will provide all administrative facilities.

(iv) It is noted that in certain areas where R.C.A.F. are the predominant Service such as at major Airports, etc. all administrative facilities are provided by R.C.A.F. as part of their Airport communication plant.

(c) **Army**

(i) All Joint Services communication requirements which come within the authorization of the C.S.O. (Appendix "D") may be implemented locally on approval of the Joint Services Sub-Committee Signals. Estimates are submitted to NDHQ to obtain the funds required. If the operational necessity demands immediate action, funds can be obtained from the Command or District reserve.

(ii) All other Joint Services Projects will be treated as a special project and requires approval of the Joint Communications Committee and Chiefs of Staff.

(iii) R.C. Signals are responsible for the procurement, installation and maintenance of all A.A. Defence communication facilities both operational and administrative.

(iv) R.C. Signals are responsible for the procurement, installation, and maintenance of all Coast Defence Communication facilities both Operational and Administrative.

(v) Coast Artillery Magslip Transmission systems are required at (i) Counter Bombardment, (ii) Combined Role, and (iii) Close Defence Batteries. R.C. Signals are responsible for the procurement, installation, and maintenance of all buried or aerial magslip cables, together with terminations required for the above systems. R.C. Signals, however, are not responsible for providing any part of the magslip transmission system required for A/MTB emplacements.

19. Where the term maintenance is used with reference to equipment, in this instruction, the conditions of K.R. Can. App. 6, CARO 4230 App. A para. 3 and paras. 162 and 163 of this instruction will govern.

20.

PART TWO

PURPOSES FOR WHICH COMMUNICATIONS ARE REQUIRED

Section I.—NDHQ Telephone and Teletype Networks.

Section II.—Command Telephone and Teletype Networks.

Section III.—Coast Defence Communications.

Section IV.—Anti-Aircraft Defence Communications.

Section V.—Administrative Communications.

SECTION I. (NDHQ Telephone and Teletype Networks)

21. In order to provide for administration and intelligence between and above all Army Command and District Headquarters and large establishments certain communication facilities are authorized by N.D.H.Q.

(a) Commercial Long Distance Telephone Facilities.

(b) Commercial Telegraph Facilities.

(c) Army Operated Teletype Network } Army Signal System.

(d) Army Operated Wireless Network }

The last two mentioned were authorized in order to obtain an efficient point to point Army Communication System, for passing Operational or Administrative traffic, from NDHQ to the various Districts and Commands, or between Districts and Commands. These facilities are being extended or modified from time to time as required by circumstances.

22.-23.

SECTION II. (Command Telephone and Teletype Networks)

24. Extensive Long Distance Telephone, Teletype and Wireless networks are required in all Commands in order to provide an efficient Army Communication System capable of handling all operational traffic and a large portion of the administrative traffic between the various Fortress or Defended Areas. Charts showing typical Telephone, Teletype and Wireless Networks are included as appendix "A".

25.-26.

SECTION III. (Coast Defence Communications)

27. Coast Defence Communications are required for the following purposes:—

(a) To Operate and Control the Artillery Armament, Coast Artillery Searchlights, and the Area Commander's circuits for orders and information; Fire Commander's command circuits to all Batteries; Range finding circuits from Fortress Plotting Room to all Counter Bombardment Batteries; Fortress and Local Alarm Circuits as well as Electric Light Officer's Circuits to all Coast Artillery Searchlights.

(b) To Operate and Control Infantry and Beach Defences from Area Headquarters to Infantry Sectors and thence to Beach Defences.

(c) To provide R.C.N. Control of craft entering and leaving port. This includes the provision and maintenance of circuits required by the Naval Officer in Charge, Extended Defence Officer, Chief Examination Officer and Selected Military Officer to such points as Examination Bty., Port War Signal Station, Boom Gate Office and Vessels, Controlled Minefield Stations, Indicator Loop Stations, Asdic Stations, F.C. Post, Defence Headquarters and Radar telling lines for early warning, etc.

(d) To co-ordinate with R.C.A.F. in connection with "Coast Artillery Co-Operation". Normally, information from aircraft engaged in spotting is transmitted by the observer to a ground wireless station located near F.C. Post, and repeated over telephone circuit to Fire Commander. This practice has been modified to suit present spotting procedure, whereby the observer reports to R.C.A.F. control room, and information is transmitted direct to Fire Commander, provision being made for Fire Commander to monitor aircraft transmission by means of a wireless receiver located at F.C. Post.

28. (a) All material and equipment necessary to provide communications as noted above is procured and maintained by RC Sigs. in so far as possible, and installations are governed according to the Scale of Signal Apparatus for Coast Defences. Variations are made only where local conditions warrant a change, and where approval of the C.S.O. and Col. Fixed Defences has been obtained. NDHQ authority will be necessary if large scale deviations are made. (b) Once the policy of establishing a Fortress or Defended Area is settled and NDHQ authority has been obtained for the Required Fixed Signal Services, no further reference to NDHQ is necessary before implementing the required services, even though rented or leased lines, pole attachment space or telephones are required as an interim measure. Provided, however, that this authority to proceed with interim measures will be exercised by commands in conformity with, and having due regard to, operational requirements as they exist at the time each specific interim project is undertaken.

29. Typical Coast Defence Communication Drawings are included in Appendix "B".

30.

SECTION IV. (Anti-Aircraft Defence Communications)

31. A.A. Communications are required for the following purposes:—

(a) Control of Light and Heavy AA Guns, Broadcast—Warnings—Orders.

(b) Receipt of Early Warning { PF and ZPI Plots-engagement reports, Liaison intelligence-GL data.

(c) Administrative System.

32. Authorized A.A. Circuits are as follows:—

L.A.A. Circuits

One command line from GDOA to each Tp. H.Q.—used for broadcasts from AAOR and also for engagement reports up to AAOR. This line is also bridged to the main AAOR swbd. and is terminated on a concentrator at Tp. H.Q.

One omnibus command line from each Tp. H.Q. to each associated gun site and to the gun shelters or section barracks if there is no gun shelter. This circuit also terminates on the concentrator at Tp. H.Q.

One administration line from Area swbd. to each Tp. H.Q. This terminates on a separate tel. at Tp. H.Q. and **NOT** on the concentrator.

L.A.A. Alarms

One generator at each gun site and one bell Loud Ringing at the associated section barracks or gun shelter, whichever is located adjacent to the gun.

H.A.A. Circuits

One circuit from GDOA (Broadcaster in AAOR) to site swbd. and bridged to Plotter No. 5 in the site P.R. This is for broadcast warnings, orders and information, and at the AAOR is bridged to the main swbd.

One circuit up from Plotter No. 7 at the HAA site to a plotter on the PF table at AAOR: used for up PF plots and for reports.

The above two lines are the minimum for each HAA site.

If the site is equipped with ZPI, one line is required from PL. No. 6 to ZPI table in the AAOR. Usually not more than a total of two ZPI lines will be required to each AAOR.

Lateral lines should be installed between adjacent HAA PR's. Geographical layouts, etc., in some cases will limit the number of lateral lines feasible.

One Administrative line from area swbd. to each HAA Bty. HQ.

One line between each HAA-PR and its associated Bty. HQ.

Loudspeaking Telephones:

No. 2 complete at each HAA site with Control Station located at GPO's position in C.P. and one speaker at each gun emplacement.

Radio:

One F.M. set in each HAA-PR and also a similar set at AAOR in the Signal Room.

H.A.A. Alarms:

One Generator in each HAA-PR and bells in associated barrack bldgs. and messes. (eight bells provided for each Bty.).

AAOR Lines

In addition to the lines to and from LAA and HAA mentioned above, the following circuits are required:

Telling Line—R.C.A.F. sector ops. to R.C.A.F. table in AAOR.
Telling Line—R.C.A.F. Group ops. to R.C.A.F. table in AAOR.

Liaison and intelligence line R.C.A.F. Sector Ops. to AAOR swbd.

Liaison and intelligence line from R.C.A.F. Group Ops. to AAOR swbd.

A line from Sector Ops. to AAOR Swbd. for AALO.

A line from Group Ops. to AAOR Swbd. for AALO.

The above R.C.A.F. lines are maximum requirements. In most cases in Canada, lines from both Group Ops. and Sector will not be required. Also some of these R.C.A.F. lines will not be needed if the AAOR is located in Sector Ops. Bldg.

Two lines are required from AAOR to F.C. Post: one is used for warnings down from GDOA and the other for CD. No. 1 plots (early warning) of low flying aircraft. These plots are picked up by the Fire Commander's Radar set and correspond to ZPI information. Fire orders to AA guns used in a close defence role are transmitted over the first of these lines which is bridged to the main AAOR swbd.

A line is required from AAOR to Navy Oprs. for warnings Liaison, etc.

Another Navy line for fire orders (from GDOA) is necessary where AA on ships in Port is included in the Defence Scheme.

A line to the Fortress Commander should also be included. This is used for warnings —Intelligence reports on land battles, ground targets, etc.

One ARP line is necessary. This is used for warnings, location of fires, etc.

If the distance is not great and if facilities are available, there should be a line to any adjacent AAOR.

An administration line is required at AAOR. This line should terminate on a separate telephone set and not on the AAOR command swbd.

A.A.S.L. Circuits

Where A.A. Searchlights are in use, lines from AAOR to AASL sites will also be required.

33. Typical Anti-Aircraft Defence Communication Drawings are included in Appendix "C".

34.-35.

SECTION V. (Administrative Communications)

36. An Administrative signal system comprises all communications, other than those provided primarily to fulfil a tactical or training requirement, used in administering the troops and establishments in the area for which it is provided.

37. Local circumstances govern to a large extent the types and size of switchboards. The following fundamental practices are quoted in order to obtain uniformity and standardization of provision and installation.

(a) In most cases the large establishments, associated with a Command or District Headquarters, are located at some considerable distance from each other. This condition favours the installation of a Main Switchboard at Command or District HQ with sub-exchanges at each of the other large establishments such as Fortress H.Q., R.C.O.C. Depots, Large Military Hospitals, District Depots, Embarkation Depot, Transit Camps, Training Centres, etc. Where required tie trunks are provided between the various switchboards, and each switchboard is connected to the commercial telephone company, operating in the particular area by means of trunk lines, the number of which is governed by the traffic involved. With the possible exception of large District Headquarters and Fortress Areas, a Common Battery, dial equipped, non-multiple P.B.X. type of switchboard is recommended—a maximum of two positions with a capacity of 160 lines being satisfactory. Where a larger type of switchboard, but not over three positions, is required, a multiple type C.B. Dial Equipped PBX switchboard is recommended. Certain very large Fortress Areas, Training Camps or District Headquarters handling over 300 lines require a Common battery Multiple Type of Switchboard —availability and cost being the controlling factors. Where the number of services required is very limited, such as at a small Hospital or Depot, a 10-line Cordless P.B.X. is recommended. A feature of using this type of switchboard is that no permanent operators are required since a clerk can operate efficiently along with other routine duties. In the various Smaller Defended Areas, a single or two-position Common Battery P.B.X. is satisfactory and can usually care for all Army requirements in the Area. Methods of provision are covered in Part Four.

38. In order to obtain efficient personnel and operating practices, all administration switchboard operators are placed under the CSO's or District Signal Officer's supervision thus allowing for selection and training to standardized methods. Typical operating practices and trick schedules are contained in Appendix "D".

39. All military switchboards which serve the administrative needs of a Command or District H.Q. are manned wherever possible with civilian or C.W.A.C. personnel rather than R.C. Sigs. personnel. This practice is economical and efficient particularly with regard to manpower and will release R.C. Signals personnel for other duties. Operators are to be shown on District or Command Signals establishments. Switchboards which are provided to serve the administrative needs of one arm, department, or unit will be manned by civilian or C.W.A.C. operators on the establishment of that arm, department, or unit but, as stated in para. 3 above, will be under supervision of R.C. Signals for Operating Practice, Trick schedules, accounting practices and records. The supervision so exercised will in no way interfere with the normal administration of operators by the officer in charge of the particular arm, department or unit but will rather assist in determining the most efficient method of switchboard control.

40. All operators are subject to the Official Secrets Act and should be warned when first engaged or put on duty that anything heard in the course of their duties is not to be divulged except as a matter of duty, and to the officer to whom they are responsible.

41. Operators at military exchanges record all toll and trunk calls and are entitled to enquire from any subscriber whether a call originated by him is official or private. Should an operator have any reason to doubt the authenticity of an official call, the call will be completed, but reported to the officer to whom they are responsible.

42. All military telephone systems whether Department owned or rented are controlled by the Department.

43. The policy concerning the leasing or renting of communication facilities is outlined in Part Four.

44.-45.

PART THREE

CO-ORDINATION OF SIGNAL REQUIREMENTS

Section I.—Joint Service Sub-Committee (Signals).

Section II.—Dept. of Munitions and Supply Responsibility.

SECTION I. (Joint Service Sub-Committee (Signals))

46. In order to obtain close co-ordination between the three Services and the Commercial Communication Coys., a Joint Service Sub-Committee (Signals) has been organized in each Command. It consists of the senior Signal Officers of each service and its principal functions are:—

(a) As a technical advisory committee to the Joint Service Committee in both Commands.

(b) The co-ordination of all Signals matters of interest to the three Services.

(c) Collaboration with the Commercial Communication Companies for consultation and advice regarding the use of their facilities as affecting the Services.

(d) Joint assessment and planning of all Communications which affect the three Services.

(e) Preventing unnecessary duplication of communication engineering work by the three Services.

47. Such work as A.D.C. and Coast watching communication development; co-ordination of toll line requirements between areas or long lines within an area; development of switching centres; assistance to commercial communication companies and line limiting control for dial exchange areas, all come within the scope of the work of these Sub-Committees.

48.-49.

SECTION II.

50. The Department of Munitions and Supply is charged with the responsibility of arranging for all leased or rented teletype facilities authorized for Military use in Canada. All major long line telephone facilities required by the Army in Atlantic Command and approved by the C.G.S. and Joint Communications Committee are arranged through Dept. of M. and S.

All major long line telephone facilities authorized for Army Use in the Pacific Command are arranged through the C.G.S. and Joint Communications Committee and become part of the Pacific Coast Communications Programme.

51. The above arrangement does not in any way affect the provision of Fixed Signal Services required for Coast Defence, A.A. Defence or Administrative establishments.

52. Further details of Munitions and Supply functions in so far as R.C. Signals are concerned will be found in Part Four.

53.-54.-55.

PART FOUR

PROVISION OF FIXED SIGNAL SERVICES

Section I.—Means of Communication.

Section II.—Methods of Provision.

Section III.—Army Owned Installations.

Section IV.—Rented and Leased Installation.

Section V.—General Principles of Provision.

Section VI.—Relation with other authorities in connection with the provision of F.S.S.

SECTION I. (Means of Communication)

56. The communication requirements set out in Parts I, II, and III may be met by the provision of any or all of the following means of communication.

(a) Aerial Cable, Open Wire, Outside Distribution Wire.

(b) Submarine or Buried Cable.

(c) Wireless, either R/T or W/T.

(d) Visual signalling.

57.-58.

SECTION II. (Methods of Provision)

59. Any Fixed Signal Services may be provided by:—

(a) Army owned facilities.

(b) Rented or leased facilities.

(c) A combination of Army owned and rented or leased facilities.

60. In considering which method is to be adopted, the following factors must be taken into account:—

(a) **Economy of Provision**—the cost of Army owned facilities, the normal life of plant, and the annual cost of maintenance, must be compared with the cost of renting or leasing and, in the absence of special military reasons for installing army owned facilities, the most economical method should be adopted.

(b) **Security**—Communications facilities required primarily for operational purposes within a Command or District will be installed and maintained by R.C. Signals where it is economical to do so. In certain cases it will be found necessary to rent or lease long lines between Defended Areas and District or Command Headquarters. These lines will be on a point to point basis or on a Services controlled Toll System basis, and are not subject to the same possibility of overhearing by unauthorized persons, as would be the case if regular commercial facilities were utilized.

(c) **Future Maintenance**—Army owned installations should be made only when future maintenance by R.C. Signals personnel will be both satisfactory and economical, or, where for security reasons, this type of installation is essential.

(d) **Legal Rights to erect pole lines for aerial cables or open wire plant on other than department owned property or lay submarine cable**—In Fortress or Defended Areas permission can usually be obtained from the Commercial Company operating in the area, to erect vital military communications along their existing pole line plant or over their right of way. Permission to build along highways is arranged by the CSO in direct liaison with the Provincial Department of Highways.

Where no facilities exist, and on determination of the requirement in co-operation with the R.C.E., arrangements are to be made through the R.C.E. to procure the necessary right-of-way and arrange for contracts as required. Permission for the laying of Submarine Cable in navigable waterways is obtained from the local Naval authorities, and on completion, details of the cable and the route followed will be submitted to NDHQ. This information is then passed to Naval Services and the Public Works Department for their records. All information in connection with the laying of submarine cable for defence purposes is classified as secret, and is not transferred to charts available to the public, unless specifically authorized by NDHQ.

61.-62.

SECTION III. (Army Owned Installations)

63. Army owned installations may be made by:—

(a) R.C. Signals Personnel.

(b) A contractor (usually the Commercial Co. operating in the Area).

(c) A combination of (a) and (b) above.

64. The advantages of installation by R.C. Signals are as follows: (a) A high degree of secrecy is obtained, (b) all records are in the hands of the Army, and (c) signal personnel employed have a complete knowledge of the layout which is essential for operational systems.

65. Installation by a contractor is sometimes resorted to where the installation is of considerable size, and sufficient trained R.C. Signals personnel are not available. This method applies particularly to large Camps and Training Centres.

66. Installation by a combination of R.C. Sigs. personnel and a contractor is arranged, (a) when urgency of an installation necessitates that every effort be made to complete a project within a stated time, (b) In certain cases a contractor is utilized to provide highly skilled technicians, who are not available in the particular R.C. Sigs. unit undertaking a project.

67. Details with regard to placing contracts or calling for tenders are contained in Part Eight.

68.-69.-70.

SECTION IV. (Rented or Leased Installations)

71. Rented or leased installations represent a large portion of the telephone systems required by the Army, and this fact makes it essential that every installation of this type should be thoroughly analyzed, and every effort made to see that only the minimum requirements are installed which will provide efficient service to the establishment concerned.

72. In all transactions with the Commercial Communication Companies in Canada, the services are treated in the same manner as the general public, being charged the official tariff rates which are in effect in the various provinces. All facilities rented or leased by the Services are covered locally by means of an agreement or contract. In order to efficiently control the extensive communication systems which are required for military purposes, certain authorities are decentralized to the G.O.C.-in-C.'s, G.O.C.'s, and D.O.C.'s, who will be able to exercise rigid control through their **C.S.O.'s,** Command Signals Officers and **District Signal Officers,** respectively. These Signal Officers will be the only officers in the Commands or Districts authorized to negotiate with Commercial Telephone Companies for the provision of Army rented or leased telephone facilities within the scale of authorization as laid down in routine orders. They will furthermore be the only officers authorized to sign agreements or contracts associated with the provision of such facilities, unless the services include items known to require NDHQ sanction, when the Command or District will seek NDHQ authority. The fact that a service has been accepted in principle by NDHQ, and that funds have been allotted for it, does not absolve the Chief Signal Officer or District Signal Officer from the responsibility of seeking specific approval for those portions of the service which are known to require NDHQ authority, unless a statement containing full details of such services, and calling attention to the need for specific approval has previously been forwarded to NDHQ. Details of accounting duties, records, etc., in connection with Rented or Leased services are given in Part Eight.

73. Rented or leased telephone equipment provision is arranged with the Commercial Communication Company in accordance with existing practices observed by the Company concerned. No attempt will be made to legislate for special equipment unless it is specifically required for a special service.

74. See appendix "D"—(1) for Rented or Leased Fixed Signal Services Policy of Provision.

SECTION V. (General Principles of Administrative Telephone Provision)

75. The Directorate of Signals has assumed control of all telephone services in the commands and districts, and as a result, the Chief Signal Officers, District Signal Officers and Command Signal Officers, must become fully familiar with all telephone matters so that they may be prepared to properly assess all telephone problems in order that the service best suited, is provided. Assessments should be made on the basis of economy and necessity so that recommendations may be fully substantiated in the interests of the war effort. To assist those concerned, a general policy is submitted herewith containing pertinent information as to procedure and methods to be applied in controlling telephone service and equipment. Data dealing with long distance usage, busy studies and traffic studies, etc. will be of assistance in handling inquiries from units within the District or Command. This information is of a general nature, and should serve as a guide in dealing with the various commercial and traffic aspects of communications.

76. Service and Equipment Requirements—Factors which should be considered in determining service requirements are as follows:—

(a) Establish the necessity for telephone service.

(b) Review the possibility of using an existing telephone by a slight re-arrangement or change in location of the instrument.

(c) All practicable devices, including the use of simple wiring plans, shall be used to conserve station equipment.

(d) Greater use of bridged stations.

(e) The installation of extensions to locals rather than locals. This procedure in many instances will work efficiently, tend to conserve switchboard facilities and reduce number of cable conductors required. Care should be exercised to see that the use of bridged or extension telephone does not affect the efficiency of the user to a point where it might be detrimental to the war effort.

(f) **Construction:—**

(i) Use of smallest sizes of cable possible with objective to maintaining a high fill.

(ii) Use of smallest gauge cable in keeping with acceptable transmission levels and supervision limits. Use of steel open wire construction where this type of construction is practicable and the conservation of critical materials can be affected.

(iii) Limit the use of underground construction (tape armoured cable or conduit) except for building entrances insofar as practicable.

(iv) Cable should not be engineered to provide future facilities for proposed areas or buildings unless such construction has been authorized as a definite project.

(v) Paralleling cables should be provided rather than replacing cables in cases where relief facilities are needed.

77. (a) **Switchboards**—In determining the need for Switchboard facilities the following points may be considered:—

(i) The necessity for centralization of incoming calls and their subsequent disposal.

(ii) The number of Individual lines required.

(iii) The amount of inter-communication.

(b) **Traffic Analysis**—A traffic analysis is a study made by the Telephone Company or the Signal Officer in which the various types of calls, i.e. incoming and outgoing, local to local calls, etc. are analysed with a view to determining the need for additional facilities. A traffic analysis may be divided into two parts—(i) Busy Study; (ii) Traffic Study.

(i) **Busy Study**—The purpose of the busy study is to determine the number of trunks required to give adequate service during the average busy hour. This study is taken over a three or four day period during which time the number of calls, the number of minutes the trunks are engaged (Holding Time), and the number of rejected calls, are recorded on an hourly basis. A busy study should be made in close conjunction with the Telephone Company who have the necessary equipment available. Sample busy study at Appendix "D". A review of the study taken should be made with the assistance of the Telephone Company to determine the need for additional trunk facilities.

(ii) **Traffic Study**—A traffic study is made to assist in determining the need for additional switchboard positions. It is taken over a three or four day period, during which time a tally is kept at the switchboard and the number and type of calls is recorded on an hourly basis. Most telephone companies have adopted a co-efficient for the different classes of calls, and by using these co-efficients the number of units of work may be obtained. The various types of calls received at the switchboard and the co-efficients applied are as follows:—

Type of Call	Co-eff.
Local to local	.90
Outgoing-local completes call	.90
Outgoing-local hangs up, attendant completes call	5.36
Outgoing-local remains on line, attendant completes call	1.66
Toll when operator takes details and advances call	10.00
Incoming-trunk calls	1.15
Allowances for messages taken and delivered	7.65
Transfer of calls	.90

The position requirement is based on the total number of units for the busy hour. It has been found that one operator on a single position PBX can efficiently handle 175 units of work. If the study showed that the number of units during the busy hour were 250, the position requirement would be 250 ÷ 175 or 1.4 positions. Therefore, an additional position would be required. Due to increased team work the efficiency of the group increases with its size, so that each operator on a 2-position board should be able to handle 200 units, on a 3-position board the operator could carry a position load equivalent to 220 units. Sample Traffic Study is attached at Appendix "D". In considering additional

switchboard facilities the Signal Officer must be satisfied that the excessive use of switchboard facilities for personal and non-essential business calls have been eliminated and that trunk holding time has been kept to a minimum by a more expeditious conversational procedure.

78. **Training of Switchboard Operators**—A switchboard manned by operators who are poorly informed on the proper methods of operation is detrimental to the efficient functioning of the entire telephone system served by the P.B.X. The switchboard being the centre of the communication facilities requires operators, capable of efficiently despatching calls with the least possible delay. A further requisite of all personnel is a pleasing manner and a pleasant and distinct voice. The training of Switchboard operators is the responsibility of the Signal Officer and the N.C.O. in charge of the switchboard. The training programme should consist of demonstration, practice and constant supervision until the operator is familiar with and proficient, in the handling of the various types of calls and connections as outlined below:—

(a) **Trunk to Local Calls (Incoming to local)**

(i) Straight Call—trainee is shown how to plug into jack immediately below lighted signal with front cord of pair, announce name, acknowledge request for local, and with back cord of pair plug into the desired local and ring.

(ii) **Line busy—calling party waits**—on a trunk to local call where the desired local is "busy", operator will ask calling party if he wishes to wait, she will report back to calling party every 30 seconds, if, at the end of two minutes the line remains busy she will ask calling party if he wishes to leave his number and she will have local call him when he is free—a memorandum of name and number will be kept.

(iii) **Don't Answer**—on a trunk to local call where the desired local does not answer, operator will report that local does not seem to answer, she will ask the calling party if he wishes to leave his name and number and she will have local call him as soon as he returns.

(iv) **Request of Transfer**—on a trunk to local call where the operator has connected a party to a local and local user flashes back, she will operate key and go into the line, the local will ask her to connect the calling party to another local, operator will acknowledge order and take down back cord and connect to desired local.

(b) **Local to trunk call (Outgoing to Central Office)**

(i) **Local to trunk call—local makes own call**—Local lamp lights, operator plugs into jack with back cord, local user asks for an outside line, operator plugs front cord of pair into an idle trunk and local completes his own call.

(ii) **Local to trunk—operator advances call**—Local user asks for an outside number, operator either dials number or in a manual office passes it to operator in Central Office.

(c) **Local user calls an outside party by address or name**—Operator looks on list of frequently called numbers, if name does not appear she looks in local telephone directory, if listing does not appear she will ask information operator for number, when she has obtained number she will complete call in the usual way.

79. (a) **Long Distance Use and Control**

(i) The use of Long Distance facilities is subject to abuse, for example, such Army services as Teletype-writer or Wireless are overlooked when their use would be as practicable and certainly much more economical than commercial toll services. In this connection, the Army has developed a Teletype network throughout Canada, which connects practically all the District Headquarters, Atlantic and Pacific Commands, Newfoundland, Washington and New York. These circuits are available for person to person teletype conversations during periods of the day when message loads are not heavy.

(ii) It has been found that regardless of instructions pertaining to the limited use of toll service, establishments find the monthly charges steadily increasing.

(iii) Control of toll expenditures is the responsibility of the Signals Officer, and provision must be made to maintain a record of all Long Distance calls and costs so that comparison can be made each month.

(iv) Accounting procedure and methods of recording Long Distance calls will be found in Section Eight.

(b) **Toll calls**

(i) Local user wishes to place Long Distance call, operator records details of call, etc. and passes call to Toll operator at the Telephone Company (see para. 5).

(ii) **Incoming calls from Toll Office**—reports on a delayed call.

(iii) **Incoming calls from Toll Office**—local does not answer, toll operator leaves word to have local call the toll operator.

(c) **Local to Local**

(i) Straight call.

(ii) Line busy, calling party asks to be called.

(iii) Don't answer, calling party accepts a don't answer report.

(d) **Miscellaneous operation conditions**

(i) How to put up a night connection.

(ii) How to release a night connection.

(iii) When and how to use buzzer key.

(iv) When and how to use battery key.

(v) Operation of tie lines.

(vi) Collect, messenger, appointment and conference calls.

(vii) Reaching party who may be at any one of several locations.

(e) **Equipment and Service Difficulties**

(i) Proper care of equipment.

(ii) Examples of switchboard troubles.

(iii) Procedures to be followed in case of trouble with equipment.

(iv) Reporting to repair service (method of reaching repair).

(v) Equipment reported out of order not to be used again until repaired.

(vi) Frayed cords, broken keys or signals, noise on line.

(vii) Examples of trouble reported to repair and requiring added attention or action by operator.

80. Standard Tricks for Telephone Switchboard (PBX) Operators

(a) In general, traffic loads on district and command telephone PBX's conform very closely in volume and distribution to those in commercial firms with corresponding numbers of locals, trunks and operating positions. Under these circumstances it appears reasonable to provide operating forces for Army switchboards on the basis which has been found most practicable on commercial boards as a result of years of experience and research. Therefore, the "trick" system of force adjustment will be used rather than the "shift" system.

(b) Most tricks consist of two four-hour periods separated by a meal period of either one or one-and-one-half hours' duration. A few morning-evening "split" tricks are provided but use of these should be kept to a minimum as they present certain undesirable working condition features. Meal periods are as nearly as possible confined to the customary times of day. No continuous period of work exceeds four hours duration and a brief relief of ten or fifteen minutes should be allowed about half way through each such period. No undue strain will then be felt by the operators.

(c) To prepare an operator trick schedule for a PBX the following steps are necessary:—

(i) Estimate how many operators are required during the busy periods of the day and the length of these busy periods.

(ii) Estimate the number of operators required during meal periods and in the evening.

(iii) The preparation of trick schedules can only be done by the trial and error method. Sample trick schedules may be found at Appendix "D".

(d) As a guide in the estimating of (a) and (b) above, experience has shown that each experienced operator should be able to handle without strain approximately 175 calls during the busiest hour on a two-position board and 200 to

225 calls on a three- or four-position board. The efficiency of the group increases with its size due to increased team work. Periodic counts of calls handled each hour should be made to determine personnel or equipment loading.

(e) Generally the same force will not be required on Sundays as on week days and separate Sunday schedules will therefore be prepared. Each operator assigned to Sunday work shall be given a day off during the ensuing week and his place taken by a relief operator. There will thus be required one relief operator for every six Sunday operators. A separate roster shall be maintained for Sunday work.

(f) With the possible exception of the N.C.O. or operator in charge, all operators should be rotated through the schedule. An operator should be assigned to a trick for not less than one week. An operator assigned to a relief trick will not work the same hours each day of that week, but will work the trick of the operator being relieved.

(g) It is considered that an eight hour day for day and evening operators and a nine hour session for night operators is quite reasonable. No day or evening operator will be required to operate for more than four hours at any one time, which should eliminate any possibility of undue fatigue. It is unlikely that the traffic handled during the night hours will be heavy enough to cause the night operator any discomfort; in fact there will often be periods of considerable length when no traffic will be offered.

(h) As an example of the use of standard operating tricks, Appendix "D" has been prepared giving a sample schedule for a four-position PBX. In this example all four positions must be covered during parts of the morning and afternoon, and two or three operators are sufficient during the lunch hours and after 1700 hours. Actually five people are scheduled to be on duty for several hours during each morning and afternoon in order to give the person in charge opportunities for doing clerical work and training personnel. An additional two people will be required on the establishment to take care of furloughs, illness, Sunday reliefs, etc. The total establishment for such a PBX will therefore be nine people. If, however, only one operator is required after 1700 or 1800 hours, an establishment of eight people would be adequate, and if the PBX is not covered during the night hours a further reduction of at least one and possibly two people can be made as the number of people to be relieved for Sunday work and furloughs is correspondingly smaller than the number shown in the sample schedule.

(i) An example of a minimum schedule for single position boards or for Sunday conditions on a multi-position board, is shown at Appendix "D".

81. **Definitions and Abbreviations**

(a) Following is a list of commonly used telephone terms with definitions. For use in keeping records and making returns to N.D.H.Q., abbreviations as shown will be used, except in official correspondence.

Telephone System—A telephone system is an assemblage of telephone stations, lines, channels and switching arrangements for their inter-connection, together with all the accessories for providing telephone communication.

Telephone Exchange—A telephone exchange is a telephone system for providing telephone communication within a particular local area, usually within or embracing a city, town or village, and environs.

Private Branch Exchange—PBX—A private branch exchange is a telephone system, usually installed on the premises of a subscriber, having centralized switching equipment for interconnecting the stations of the subscriber and for connecting these stations to central office lines.

Common Battery Central Office—A common battery central office is a central office which supplies transmitter and signalling currents for its associated stations and current for the central office equipment from batteries located in the central office.

Magneto Central Office—A magneto central office is a central office serving stations each of which is provided with a local battery for talking and a magneto for signalling.

Dial Central Office—A dial central office is a central office of a dial telephone system.

Telephone Subscriber—A telephone subscriber is a customer of a telephone system who is served by the system under a specific agreement or contract.

Telephone Operator—A telephone operator is a person who handles switching and signalling operations needed to establish telephone connections between stations or who performs various auxiliary functions associated therewith.

Telephone Station—A telephone station is an installed telephone set and associated wiring and apparatus, in service for telephone communication.

Note:—As generally applied, this term does not include the telephone sets employed by central office operators and by certain other personnel in the operation and maintenance of a telephone system.

Main Station—A main station is a telephone station with a distinct call number designation, directly connected to a central office.

Extension Station—X—An extension station is a telephone station associated with a main station through connection to the same subscriber line and having the same call number designation as the associated main station.

Public Telephone Station—PS—A public telephone station (often referred to as a "pay station") is a station available for use by the public generally on the payment of a fee which is deposited in a coin collector or is paid to an attendant.

Telephone Set—A telephone set (often abbreviated "telephone") is an assemblage of apparatus including a telephone transmitter, a telephone receiver, and usually a switch, and the immediately associated wiring and signalling arrangements for the use of these instruments in telephony.

Common Battery Telephone Set—A common battery telephone set is a telephone set for which both the telephone transmitter and the signalling currents are supplied from a central office, private branch exchange or other centralized power source.

Local Battery Telephone Set—A local battery telephone set is a telephone set for which the transmitter current is supplied from a battery, or other current supply circuit, individual to the telephone set. The signalling current may be supplied from a local hand generator or from a centralized power source.

Magneto Telephone Set—A magneto telephone set is a local battery telephone set provided with a hand generator, or magneto, for supplying signalling current.

Dial Telephone Set—A dial telephone set is a telephone set equipped with a dial.

Deskstand Telephone Set—D—A deskstand telephone set is a telephone set having a deskstand.

Deskstand—A deskstand is a movable pedestal or stand (adopted to rest on a desk or table) which serves as a mounting for the transmitter of a telephone set and which ordinarily includes a hook for supporting the associated receiver when not in use.

Hand Telephone Set—H—A hand telephone set is a telephone set having a handset and a mounting which serves to support the handset when the latter is not in use.

Handset—A handset is a combination of a telephone transmitter and a telephone receiver mounted on a handle.

Wall Telephone Set—W—A wall telephone set is a telephone set arranged for wall mounting.

Operator's Telephone Set—An operator's telephone set is a telephone set which consists of a head receiver, a telephone transmitter usually supported on a breastplate, and the associated cord and plug.

Anti-Sidetone Telephone Set—An anti-sidetone telephone set is a telephone set which includes a balancing network for the purpose of reducing sidetone.

Sidetone Telephone Set—A sidetone telephone set is a telephone set which does not include a balancing network for the purpose of reducing sidetone.

Station Ringer—A station ringer is an alternating-current electric bell or similar device associated with a telephone station for indicating a telephone call to the station.

Telephone Line—Telephone line is a general term used in communication practice in several different senses, the more important of which are:—

(a) The conductor or conductors and supporting or containing structures extending between subscriber stations and central offices or between central offices whether they be in the same or different communities.
(b) The conductors and circuit apparatus associated with a particular communication channel.

Subscriber Line—A subscriber line (sometimes called a "subscriber loop" or "central office line") is a telephone line between a central office and a station, private branch exchange or other subscriber switching equipment.

Individual Line—I—An individual line is a subscriber line arranged to serve only one main station although additional stations may be connected to the line as extensions.

An individual line is not arranged for discriminatory ringing with respect to the stations on that line.

Party Line—Pty—A party line is a subscriber line arranged to serve more than one main station. Provision is made for discriminatory ringing with respect to the stations of each subscriber on that line.

Tie Trunk—Tie Trk—A tie trunk is a telephone line or channel directly connecting two private branch exchanges.

Trunk—Trk—A trunk is a telephone line or channel between two central offices or switching devices, which is used in providing telephone connections between subscribers generally.

Toll Line—A toll line is a telephone line or channel between two central offices in different exchanges.

Manual Telephone System—A manual telephone system is a telephone system in which telephone connections between customers are ordinarily established manually by telephone operators in accordance with orders given verbally by the calling parties.

Dial Telephone System—A dial telephone system is a telephone system in which telephone connections between customers are ordinarily established by electric and mechanical apparatus controlled by manipulations of dials operated by the calling parties.

Audible Busy Signal—An audible busy signal is a signal audible to the calling party, indicating that the called party's line is in use.

Dial Tone—Dial tone is a tone employed in dial telephone systems to indicate that the equipment is ready for the dialing operation.

Telephone Switchboard—A telephone switchboard is a switchboard for interconnecting telephone lines and associated circuits.

Switchboard Position—A switchboard position is that part of a switchboard designed for the use of one operator.

Cord Circuit—A cord circuit is a connecting circuit terminating in a plug at one or both ends and used at switchboard positions in establishing telephone connections.

Multiple—(a) (Noun) A multiple is a group of terminals arranged to make a circuit or group of circuits accessible at a number of points at any one of which connection can be made.

(b) (Verb) To multiple is to render a circuit accessible at a number of points at any one of which connection can be made.

Plug—A plug is a device to which may be attached the conductors of a cord and which, by insertion in a jack, establishes contact between the conductors

of the attached cord and the conductors connected permanently to the jack. The plug most generally used has three separate contacting parts: the tip, the ring and the sleeve.

Jack—A jack is a connecting device to which the wires of a circuit may be attached and which is arranged for the insertion of a plug. The jacks most generally used have three separate contacting parts: the tip spring, the ring spring and the sleeve, which make contact with the corresponding parts of the plug.

Trunk Hunting—Trunk hunting is the operation of a selector, or other similar device, in moving its wipers or brushes to a terminal or contact associated with an idle circuit of a chosen group. This is usually accomplished by successively testing terminals associated with this group until a terminal is found which has an electrical condition indicating it to be idle.

Dial—A dial is a type of calling device, which, when wound up and released, generates pulses required for establishing connections in a dial system.

One Way Trunk—A one way trunk is a trunk line connected to a PBX and so arranged to provide out-going service.

Private Line—PL—A telephone line or channel directly connecting two or more telephone stations.

Wiring Plan—WP—A switching device to provide cutoff, pickup, holding and intercommunicating on one or more subscriber lines.

Mileage—MLGE—A monthly charge applicable to service located on other than the same premises.

Extension Bell—XB—A bell in excess of the number of stations.

82.-84.

SECTION VI. (Relations with Other Authorities in Connection with the Provision of Fixed Signal Services)

85. It is the responsibility of each of the three services to determine the communication facilities necessary for their particular requirements, both operational and administrative, and arrange for their provision. This does not imply however, that each service will actually provide these facilities. The work of installation may be carried out by the service which is in the best position to be able to undertake it or by contract with a Commercial Company. In the case of large Joint Services projects, the Joint Communications Committee at NDHQ agrees on a fair distribution of cost and on approval of the Chiefs of Staff, one of the Services is selected to control and finance the project. Reclaiming action is taken with the other services for their proportionate share of the cost. In cases of (Minor) Joint Service communication requirements, the Joint Communications Sub-Committee (signals) approves the project and if R.C. Signals are delegated to do the work, all costs are charged against Fixed Signal Services.

86. As the Army is more concerned with communications involving landlines within a Fortress or Defended Area than the other Services, and consequently is better equipped to deal with such installations, it is usually called upon to co-ordinate the line signals requirements of all three Services, and to provide a great many of them by inclusion in the Fixed Signal Services Communication Plant.

87. The Army provides all operational communications except radio required by the Navy for port control, in conjunction with its own Fixed Signal Service Requirements.

88.

89.-110.

PART FIVE

FIXED SIGNAL SERVICES REPORTS (to be submitted by CSO's and DSO's)

Section I.—Annual Reports.

Section II.—Monthly Reports and Balance Sheets.

Section III.—Special Progress Reports (Preliminary, Progress, Final).

SECTION I. (Annual Reports)

111. Annual Reports will be submitted to NDHQ each year on or before the 1st of April. This report is intended to serve as a record of activities during the year and will be made up of:

(a) Report giving a rapid and non-technical summary of the work of the year and pointing out significant tendencies and salient points;

(b) Reports of Fixed Signal Services from the various Defended Areas, giving detailed records in connection with each;

(c) Report of expenditures under the headings as contained in form 505 "Fixed Signal Services Estimates";

(d) Conclusions, suggestions and recommendations.

112.-113.

SECTION II. (Monthly Reports)

114. Monthly Reports will be submitted to NDHQ by the 7th of each month. This report is to be a history of past transactions built around statistics and will provide a record of results, expressed in terms of money, materials, labour and accomplishments. It will serve for comparison and show tendencies. Suggested sub-headings for this type of report are as follows:—

(a) General.

(b) Coast Defence Communications.

(c) A.A. Communications.

(d) Fixed Signal Services Equipment.

In the Commands one consolidated report will be submitted by the CSO's concerned.

115.-116.

SECTION III. (Special Progress Reports)

117. Special Progress Reports will be submitted on request from NDHQ and are intended to cover only special projects. These reports will be made up of (a) Preliminary Report, which is the first one to be submitted; (b) Progress Reports; (c) Final Report, submitted on completion of Project.

118.-119.

PART SIX

Section I.—Types of Stores.
Section II.—Methods of Provision.

SECTION I. (Types of Stores)

Telephone Switchboards.
Concentrators.
Telephones.
Loud-Speaking Telephones.
Apparatus Loud-Speaking.
Indicators, Signal, Red and Green.
Alarm Apparatus.
Teletype Apparatus.
Buried Cable, Submarine Cable and Aerial Cable.
Pole Line, Open Wire and Associated Hardware.
Terminals, Binding Post Chambers, Fuse Chambers, etc.
Protectors Racking and Associated Material.
Drop and Inside Wiring Materials.
Cable Splicing Material.
W/T Equipment.
Test Equipment.
Tools and Associated Equipment.

SECTION II. (Methods of Provision)

Commercial Pattern and Equipment.
Army Pattern Stores and Equipment.

SECTION I. (Types of Stores)

120. **Telephone Switchboards.** The following types are to be used for Fixed Signal Services:—

(a) Automatic Switchboard—Although the use of Automatic Switchboards can be condoned in certain purely administrative areas, the following disadvantages prohibit the installation of Automatic Equipment in future in all Defended Areas:—
  (1) Initial cost is higher than Common Battery Equipment.
  (2) Operating efficiency can be interfered with by continuous calling.
  (3) High degree of maintenance required on all inside and outside telephone plant. This particularly applies in the event of an emergency when such a high standard of maintenance would be difficult to maintain.
  (4) Standard unit equipment cannot be used in conjunction with Automatic.

(b) Common Battery Switchboards—Normally utilized for provision of Administrative telephone facilities:—
  (1) No. 1 Common Battery Multiple Switchboard—This switchboard is used for large telephone systems and is suitable for multipled installations with capacities up to 10,000 lines. Such switchboards are always engineered for the installation under consideration.
  (2) No. 10 Common Battery Multiple Switchboard—A multiple type switchboard suitable for medium size exchange systems whose ultimate requirements will not exceed 1500 lines.
  (3) No. 12 Common Battery Multiple Switchboard—This switchboard has an ultimate capacity of 1440 subscriber lines and is used in medium sized exchange installations where multiple operation is required.

(4) No. 551-B C.B., P.B.X. dial equipped—The 551-B P.B.X. is a non-multiple lamp signal switchboard arranged for double supervision and equipped with a dialing circuit when served from an automatic exchange. The ultimate capacity of each position is 80 locals, 12 trunks and 15 cord circuits. Twenty of the local lines may be equipped with line relays.

(5) No. 551-D C.B., P.B.X. dial equipped. The 551-D P.B.X. consists essentially of 551-B sections wired for multiple connection. The ultimate capacity with 4 sections multipled together is 320 locals.

(6) No. 551-A C.B., P.B.X. dial equipped. This is a non-multiple type P.B.X. with an ultimate capacity of 40 locals, 10 trunks and 10 cord circuits, and equipped with a dialing circuit when served from an automatic exchange.

(7) No. 506-A Cordless C.B. Switchboard. This is a cordless switchboard with a capacity of 3 trunks and 7 locals and arranged for single supervision.

(c) Magneto Switchboards—Normally utilized for provision of Command Telephone facilities.

(1) No. 1240 Magneto Switchboard—This is a magneto switchboard with an ultimate capacity of 165 lines and 15 cord circuits and is equipped with shutter type combined jacks and signals.

(2) No. Special Command Switchboard (Northern Electric and Automatic Electric). This is a non-multiple magneto switchboard equipped with conference jacks. This switchboard is utilized to interconnect Command or Range Finding circuits in a Fortress or Defended Area.

(3) No. 115 Special Magneto Switchboard (Stromberg Carlson). This is a non-multiple type lamp signal magneto switchboard with lamp supervision.

(4) No. 1800 Magneto Switchboard (Northern Electric). This is a magneto switchboard with a maximum capacity of 30 lines and equipped with shutter type combined jacks and signals.

(5) No. Cordless Magneto Switchboard 10-Line (N.E.). This is a cordless switchboard equipped with 10 magneto station line circuits and arranged for drop supervision.

(6) No. Special Cordless Magneto Switchboard 10-Line (N.E.). This is a 10-line cordless magneto switchboard equipped with a terminal strap for connecting several such units together to provide additional facilities.

(7) No. N1317A Magneto Switchboard (N.E.)—This is a wall-type magneto switchboard with a maximum capacity of 15 lines and is equipped with 5 cord circuits with facilities for 2-way ringing.

(8) Switchboards 10-Line U.C.—This is an Army pattern magneto switchboard with a maximum capacity of 10 lines. Calling is accomplished by either buzzer or magneto generator and received signals are registered by lamp indication.

121. **Concentrators**—The Concentrator 5-Line is suitable for use where communication from a central point to a maximum of five outstations is required. Two concentrators can be coupled together for use where more than five lines have to be accommodated. All components of this equipment are of standard commercial pattern and as a result this unit is classified as a commercial item (N.E.). The operator's or attendant's magneto telephone set must be obtained separately.

122. **Telephones:—**

(a) Army pattern telephones suitable for Fixed Signal Services are:—
Telephone Sets, F, Mk. 1*.

(b) Commercial pattern telephones suitable for Fixed Signal Services are:—
Telephones, Common Battery Operator's chest set equipments (N.E.).
Telephones, Common Battery, hook up { F 2A3 Handset / 5A Handset hanger } (N.E.).
Telephones, Common Battery, hand, table No. 1-3 (N.E.).
Telephones, Common Battery, hand, wall, No. 2-3 (N.E.).
Telephones, Magneto, Head and Breast Single—No. MD2383 (Special type 1400).
Telephones, Magneto, Head and Breast Double.

Telephones, Magneto, hand, table, No. MD2141 (Special type 1400).
Telephones, Magneto, hand, wall, No. MD2140 (Special type 1400).
Telephones, Magneto, wall, No. 1317E—(N.E.).
Telephones, Magneto, wall, No. 1317CG—(N.E.).
Telephones, Sound Powered.

123. **Loud Speaking Telephones (Army Pattern)**

(a) Telephones L.S. No. 1 Complete are used between two director posts of a battery; between Searchlight Officer and Searchlight Directing Station when SLDS separated from S.L.O.

(b) Telephones L.S. No. 2 are used between the Command Post of a Heavy A.A. Bty. and Guns.

124. **Apparatus Loud Speaking.**

(a) Apparatus Loud Speaking No. 1 has been re-designed in Canada and provided for gun control in Coast Defence. The complete apparatus includes a microphone, an amplifier, a loudspeaker (for talk back), a power pack and a 12-volt battery for use at Command Post, C.L. Def., B.O.P. or other transmitting station, and one loudspeaker for each gun or other receiving station. The loudspeakers have been specially designed to withstand gun blast. The apparatus works from either 12-volt battery or 110-volt A.C. (made by N.E. Co. and Vancouver Radio Labs.). In future, Telephones Loud Speaking No. 2 will be installed in C.L. Def. Batteries in lieu of Apparatus L.S. No. 1 and associated 2-Light Indicator, red and green. Requests for equipment being forwarded to D. Signals in the usual way to insure provision action and necessary amendments to the authorized scale of Signal apparatus.

(b) Apparatus Loudspeaking No. 4.

125. **Indicators, Signal, Red and Green.**

Indicator, signal, red and green, 6-light (coast defence) and Indicator, signal, red and green, 2-light (coast defence) are intended for use in counter-bombardment batteries. The 6-light indicator is for mounting at the command post and consists of a metal box on which are three pairs of red and green lamps and the necessary terminals for connection to lines and battery. The apparatus works off 12 or 24-volt batteries and requires two wires and a common return.

The 2-light indicator consists of a metal box on which one red and one green lamp are mounted. Below them are one red switch and one green push-button, three terminals and a rheostat. The latter must be adjusted to suit the voltage used. The lamps on the 2-light indicator are required only to show the gun detachment that the indicator is functioning correctly.

126. **Alarm Apparatus**—Generators and Bells are used for all alarm systems required for Fixed Signal Services. This type of alarm apparatus is preferable to all other types such as sirens or horns which are operated from A.C. mains, or D.C. supply. This preference is due to the fact that it is more economical and efficient to provide generators and/or bells at every location where it is essential to have early warning than provide sirens, etc. which are uncertain in operation and cannot be relied upon during stormy weather when the range of audibility is considerably reduced. Furthermore, sirens are utilized by Civilian Defence authorities for Air Raid warning and in certain locations confusion would result should sirens be used in Fixed Signal Service applications. Alarm Apparatus is now required for:—

(a) Fortress Alarm System—which enables F.C. or any Battery Commander to warn or call into action the whole Fortress or Defended Area.

(b) Local Battery Alarm—which enables a Battery Commander to warn or call into action personnel of guns or CASL's. This applies also to A.A. Batteries. Generators will be installed at control positions such as F.C. Post, C.B. Visual B.O.P., C.B. Radar B.O.P., C.L. Def. B.O.P.'s, Command Posts, Gun Positions. The latter will not necessitate a generator at each gun but rather one generator will be installed at one of the guns which are manned. Sufficient bells will be installed to give adequate warning to all personnel required to man or operate the defences.

The following types of alarm apparatus are provided for Fixed Signal Services:
Generator—Type N290F (Special Complete with generator boxes).
Bells, Loud Ringing—Type 592 B.W.

127. **Teletype Apparatus**—The telegraph printer is a machine operated type of telegraph communication. It is designed so that it can consistently maintain a high speed of operation. It may be used for telegraph communication between such points as NDHQ and Districts and Commands between Districts, or between Defended Areas of a Command. One or more receiving stations may be operated from the same transmitter, producing a printed or typed copy of the message at each receiving station simultaneously. Commercial types of equipment are utilized as follows:—

(a) **Model No. 15 S & R Teletype Machine**—This machine is a page printer designed for interchanging messages between two or more points. A sending-receiving unit consists of a keyboard transmitting unit and a printer unit.

(b) **Model No. 19 S & R Teletype Machine**—This machine includes the following:

No. 15 S & R Teletype Machine (with standard keyboard replaced by keyboard of No. 15 perforator transmitter).

No. 15 Perforator Transmitter. Arranged for use on No. 15 Teletype machines in place of the standard direct keyboard. It has a tape perforating mechanism and character counter in addition to the features of the standard direct keyboard unit. The perforator transmitter fits into the No. 15 Machine base and the entire set is enclosed by a special cover to form the complete set.

No. 14 Transmitter Distributor. This is a device for transmitting electrical impulse signals over a circuit to one or more receiving stations. The character of the signals is determined by the code perforations in the tape that is fed through the tape transmitter. This device uses the circuit at maximum efficiency when freely supplied with perforated tape.

The following methods of operation may be selected when utilizing No. 19 type machine:—

Direct keyboard transmission to line with a printed record being produced at the transmitting point.

Simultaneous direct keyboard transmission to line and perforation of tape with a printed record being produced at the transmitting point.

Perforation of tape only with the associated printer either receiving messages from a distant station (if duplex operation provided) or monitoring the message perforated in the tape as it is being transmitted to the line.

(c) **Model No. 14 Re-perforator**—Utilized where it is desirable to re-transmit messages received from one circuit to some other machine or machines on a separate circuit. Its function is to translate the code combination, perforated in the tape, into electrical impulses and to transmit these impulses to the signalling line.

(d) **Concentrators or Teletype Switchboards** are utilized to provide a teletypewriter service in which all connections are set up on a switched basis similar to that provided for spoken conversation by the telephone system. These units are provided on special cases for large Signal Offices and are designed to meet the particular requirements of these offices.

128. **Buried, Submarine and Aerial** Cable (in Fortress or Defended Areas).

(a) **General**—For purposes of selecting the proper type of cable for use in a Fortress or Defended Area, two primary functions are considered:—

(i) **Provision of Command and Administrative Communication System for Control of all Defences by the Area Commander; of all Coast Defences by the Fire Commander; A.A. Defences by the AADC and Naval operations by the N.O. i/c.** This system employs Buried and Submarine cable where a combination of both can provide a safe and efficient main and alternate cable network.

In such cases where buried or submarine cable can be utilized for the main route but not for the alternative route, consideration may be given to use of Aerial Cable to provide an alternative route. This also applies in cases of long extensions feeding outposts which are not necessarily vital to the defence of the area involved. In this case aerial cable only may be installed and can be supported by another run of buried or submarine cable if the scale of attack is such as to warrant this requirement.

(ii) In Administrative Areas, cable plant requirements will follow standard commercial cable plant practices insofar as it is possible to do so. This will tend to provide the required cable plant in the most economic manner both with regard to provision and maintenance. Particular consideration will have to be given to the linking up to commercial or other communication systems for long distance communications.

(b) **General and Technical Considerations**

(i) All buried cables should be buried to a depth of 3 feet in common soil. This provides splinter-proof protection and enables cable trench to be readily opened in the event of trouble. In solid rock or rocky soil, cable depth will vary between 10 inches and 18 inches according to type encountered.

(ii) In any Battery Area, all circuits whether permanent or temporary, should be underground. As a guide this area may be regarded as within a radius of 400 yds. from the pivot gun.

(iii) Buried lead covered and paper insulated cables may be **double steel tape armoured** and placed directly in ground with no further protection or **jute protected** only, in which case they should be covered with planking or other suitable material or cable may be placed in ducts without covering of any sort as would be the case in Administrative Areas. The decision as to whether armouring is to be used or not is based purely on the supply situation and required speed of production. Double Steel Tape Armoured Cable is definitely preferable for use between and within the various Battery areas. Lead covered cables are quite satisfactory when protected by tile or fibre ducts.

(iv) Considering that communications within a Fortress or Defended Area will rarely exceed an overall distance of 20 miles, and considering the maximum transmission loss permissible to obtain good speech over the longest switched connection at 30 db effective rating and 2000 ohms loop resistance to obtain good ringing signals, cable having a transmission loss of 1 db per mile or less will be required. For standardization reasons, 19 ga. cable is recommended for all purposes other than large administrative areas where considerable savings would be obtained by utilizing a smaller gauge cable. In the latter case 22, 24 or even 26 ga. cable may be utilized depending on the extent of administrative system and the transmission loss involved. Care should be taken in these administrative common battery systems to limit the loop resistance to no more than 800 ohms (250 ohms for 551 type PBX Boards) and thus ensure efficient supervision and signalling ranges. Transmission losses in the local circuits of Administrative System which have access to a commercial system should not exceed 4 db (see Appendix "F" for further detail).

(v) At focal points of main or alternative buried and submarine cable routes, underground test pits should be constructed (see Appendix "G" for typical construction details). Rack mounted waterproof boxes (F type or similar) should be provided for all cables terminating in an underground test pit. Typical cable terminations together with methods and reasons for protection are more fully covered in Appendix "H" which also includes a list of the most frequently used items.

129. **Pole Line, Open Wire and Associated Hardware**

(a) In order to standardize materials required for open wire construction the list at Appendix "H" has been adopted for Fixed Signal Service requirements. The provision of standardized materials enables transfer of stores to be made in an emergency within a command which would not be practicable if materials were procured to varying specifications.

(b) The compression method of open wire splicing has been adopted for all Fixed Signal Service requirements. This method formerly required several types of tools and sleeves to cover the wide range of wire sizes encountered. On careful analysis a single tool (31 CJ) was found to be satisfactory for any wire size utilized in Fixed Signal Services, and has been adopted as standard. Suitable sleeves for this tool together with characteristics of the most commonly used open wires are listed in Appendix "H".

130. Terminals, Binding Post Chambers, Fuse Chambers, etc. (see Appendix "H").

131. Protectors Racking and Associated Material (see Appendix "H").

132. Drop and Inside Wiring Materials (see Appendix "H").

133. W/T Equipment.

(a) CD 12—Transmitter-Receiver—used for main wireless operational control of the Defences of an Area as well as Fire control of the various Batteries.

(b) (i) Frequency Modulated Transmitter Receiver Type 5 FRX (5 watt).
(ii) Frequency Modulated Transmitter Receiver Type FMTR (W) (25 watt).
(iii) Frequency Modulated Transmitter Receiver Type 50 UFS (50 watt).

134. Test Equipment

The following telephone test equipment is normally provided for Fixed Signal Service requirements:—

(a) **Fortresses or Large Defended Areas**

Item	No.
Wheatstone Bridge	L & N Type c/w case
Bridge Megger.	
Megger.	
"Cable Splicers" Tone Test Set	No. 43A
"Cable Splicers" Portable Test Set	No. 1020C
"Cable Splicers" Test Set	No. 43A & 52A
"Lineman's" Test Set	No. 1017E
Ohmeters	Weston No. 689
Testing Cabinet, Common Battery or Magneto	No. 1407C
Hand Test Set	No. 1011B

(b) **Minor Defended Areas**

"Lineman's" Test Set	No. 1017E
Ohmeters.	
"Cable Splicers" Portable Test Set	No. 1020C
Testing Cabinet—Common Bty. or Magneto	No. 1407C
Hand Test Set	No. 1011B

(c) Where a more efficient Test Board than the 1407C type is required, it is constructed locally to commercial pattern. Transmission test equipment is specifically authorized where an extensive telephone plant requires this type of equipment for efficient operation. The following units are considered satisfactory for F.S.S. requirements:—

Transmission measuring set No. 12A KS 7775.
Motor Oscillator Machine, 1000 cycle per KS 5472-01 List 2.

135.-145.

146. Economy and speed in the provision of stores for Fixed Signal Services are most desirable. If stores are ordered in small quantities and to varying specifications, costs are higher and rate of production lower than for bulk orders to standard specifications.

147. Equipment for use in Fixed Signal Services is limited to certain standard types. These types conform as closely as possible to commercial pattern equipment. Service pattern equipment listed as F.S.S. Stores may be utilized. Non-standard items will not be used except in an emergency, and will be replaced with proper F.S.S. equipment as soon as possible.

148. Methods of installation should also be standardized in the various Defended Areas. Uniformity of equipment and installation practices avoids the difficulty of training personnel transferred from one station to another in different methods of installation and various types of equipment.

149. It is essential that a sufficient reserve of Signals Stores, to permit immediate repair and replacement be held locally for all Fixed Signal Services. These stores are

to be of the same types as those incorporated in the system for which they are provided. Surplus stores or those held for Equipment no longer in use should be returned to Ordnance.

150. Bulk communication Stores for all Districts not included within a Command will be retained at Ordnance while in the case of the Commands, bulk communication stores for one year's requirement, are to be retained in the Command Signals Stores, and issued to the various Fortresses or Defended Areas periodically, according to requirements. Monthly stock reports are required from each Fortress or Defended Area in order to control material movement and insure that stocks are at the proper level at all points.

SECTION II. (Methods of Provision of F.S.S. Equipment)

151. The following items of **Commercial Pattern** Stores and Equipment are classified as F.S.S. Stores.

(a) Switchboards and Switching Systems including local telephone, central office, toll telephone, PBX telephone and telegraph.
(b) Telephone including transmitters, receivers, dials, subscriber sets.
(c) Relays, condensers, repeaters, coils.
(d) Testing Apparatus.
(e) Wire and Strand.
(f) Cable.
(g) Cable terminals.
(h) Pole Line Hardware.
(i) Plugs, Jacks, cords and keys.
(j) Wire Intercommunicating Systems (includes Loud Speaking and Light Indicator Equipment).
(k) Appliances used for Manual Telegraph.
(l) Teletypewriters, tape perforating appliances and accessories.
(m) Signalling and Selector Equipment used for telephone and telegraph systems and/or used for wire protective alarm systems.
(n) Motors, generators, storage batteries (24 or 48 volt), rectifiers, transformers, power panels and associated equipment.
(o) Apparatus Alarm (Generators and Loud Ringing Bells).

152. The following major items of **Ordnance Stores** are classified as F.S.S. Stores.

(a) Switchboards, 10-line and 6-line U.C.
(b) Telephone Sets, "F" Mk. 1*; "L"; Sound Powered and Loud Speaking types.
(c) Storage Batteries (6-volt type).
(d) Cells, Dry, Telephone Type (1½ volt).
(e) Attachments, headgear, double.
(f) Field Cables.

153. Provision action, based on estimate of **bulk** requirements for both **commercial pattern** stores and **Ordnance Stores,** is initiated by the Director of Signals (Sigs. 2) through the Director of Ordnance Services (Technical Stores). This policy applies to all equipment provision and such items of other stores as are required in bulk in all Commands and Districts—e.g. Switchboards, Telephones, Apparatus Alarm, Magslip Cable, Field Cable, etc.

154. Funds to meet the above requirements for all commercial pattern stores and equipment are provided by the Director of Signals out of the Signals Allotment. (Vote 210 Primary 94).

155. F.S.S. Stores as referred to above are despatched direct from Central Ordnance Depot direct to the Command or District concerned.

156. On receipt of F.S.S. estimates from C.S.O.'s Commands, the requirements of circuits, etc. are checked and when approved issue action will be taken in connection

with equipment and stores referred to above, i.e. Sigs. 2 will order the release of such equipment and arrange for funds to cover the construction material, etc. procurement of which is instigated in the Command or District.

157. **Local Purchase of F.S.S. equipment will only be authorized in extreme emergencies or where specific approval has been obtained from N.D.H.Q. Purchases of an emergent nature must be reported immediately.** C.S.O.'s are authorized to purchase bulk construction stores for such projects as are authorized by N.D.H.Q. Purchase being made through the local representative of the Department of Munitions and Supply.

158. All F.S.S. Equipment issued for use is placed on inventory charge of the building concerned. Inventories are completed in duplicate, signed by the Officer Commanding the battery etc. concerned, and by the Command or Section Signals Officer, each retaining one copy. The responsibility for the custody of the instruments is that of the Battery Commander or other responsible Officer when equipment is situated outside of a battery area.

159.

PART SEVEN

MAINTENANCE AND RECORDS

Section I.—Maintenance.

Section II.—Records.

SECTION I. (Maintenance)

160. R.C. Signals are responsible for the maintenance of cables, open wire, associated stores and wiring for Fixed Signal Services, whether external or within fixed structures or from fixed emplacements to moving mountings.

161. They are also responsible for maintaining all external buried cables and associated terminating and junction boxes for magslip transmission.

162. Maintenance of signal instruments held or installed for F.S.S. will be governed by the Echelon repair schedules defined in Electrical and Mechanical Engineering Regulations for such instruments.

163. Units of other arms hold, on charge as unit equipment, signals instruments which are for use in fixed defences and for connecting to a fixed signal service communications system. Maintenance of such signals instruments will be governed by the Echelon repair schedules defined in Electrical and Mechanical Engineering Regulations for such instruments. (Until such time as EMER's are developed for F.S.S. Equipment, R.C. Signals will carry out for maintenance within their capacity.)

164. Ordnance is responsible for the provision of maintenance parts for all items of Stores and the Director of Signals (Sigs. 2) is responsible for advising DOS(TS) and D ME(E5) each quarter, the total units available or in use by Districts or Commands for Fixed Signal Services.

165. Until such time as schedules are provided it will be the responsibility of CSO's and DSO's to initiate provision action on unscheduled items.

166.-170.

SECTION II. (Records)

171. It is essential that every Command and District where applicable have an adequate system of records, and maps showing all F.S.S. in each Fortress or Defended Area. Since this telephone plant is spread over wide areas, and consists of hundreds of miles of submarine, buried, or aerial cable plant, open wire plant, extensive inside plant and many other components which make up a complete telephone system, it is necessary for all these details to be tied down on paper to avoid confusion and ready identification of army owned Fixed Signal Services.

172. F.S.S. records are required at NDHQ in order to:—

(a) Avoid reference to Commands or Districts as to the existence of inside or outside plant.
(b) To show that F.S.S. are being installed in accordance with accepted policy.
(c) To indicate what stage an approved F.S.S. project has reached.
(d) To enable correspondence on F.S.S. to be carried on without confusion.

173. The following records are required by Command Signals in order to meet the conditions outlined above:—

(a) General Operational Plan of Fortress or Defended Area.
(b) Cable and Wire Diagram—These will be superimposed on a suitable topographical map (Standard GSGS map or enlargement thereof). This is a key diagram which contains such detail, as the make-up of the various routes and terminations at test points, etc. which cannot be included in the General Route Plan. This plan is not required to scale since distances, etc. are clearly marked.

(c) Route and Circuit Diagram Plans are required for every battery. These plans must be uniform and follow as close as possible the typical plans as illustrated in Signal Training Vol. VI or revised typical plans as issued from NDHQ from time to time and treated as an addition to Appendix "B" or "C" of this instruction.

(d) Separate Drawings showing W/T Systems, Teletypewriter systems, Air Defence Systems, A.A. Defence Systems, Early warning systems, switchboards and tie line facilities within District or Command. (Appendix "A".)

174. In the Commands or Districts, a record of all signal instruments classed as an F.S.S. provision must be maintained. The total number of each type of instrument installed at a particular place, such as a B.O.P., will be entered on an inventory sheet similar to that shown at Appendix "I". Instruments held spare as local maintenance reserves will also be shown against the place at which they are stored.

At each place or defence post where signal instruments are installed, a copy of the inventory for that place or post will be kept. Copies of all inventories will also be maintained in the Signal Office from which supervision of communications for a particular Fortress or Defended Area is exercised; it will probably be found convenient to consolidate the records in signal offices on to a master sheet. This consolidated record will be required by NDHQ prior to Jan. 1 in order to complete assessment of required equipment for the following fiscal year.

175. Attached as Appendix "A" are a number of typical drawings illustrating several of the plans referred to above and it is desired that future plans of this nature adhere as closely as possible to the coding, symbols and abbreviations as listed in order to obtain uniformity in plans and records.

176.

177.

PART EIGHT

FINANCIAL REGULATIONS, ACCOUNTING PRACTICES AND RECORDS

Section I.—Estimates for Fixed Signal Services.

Section II.—Allotment and Control of Funds.

Section III.—Financial Encumbrances.

Section IV.—Placing of Orders or Contracts for F.S.S. Construction and Maintenance (Army Provision).

Section V.—Accounts, invoices and records for F.S.S. Construction and Maintenance (Army Provision).

Section VI.—Placing of Orders or Contracts for Rented or Leased Facilities.

Section VII.—Accounts, invoices and records for Rented or Leased Facilities.

SECTION I. (Estimates for Fixed Signal Services)

178. The demand for a new Fixed Signal Service generally emanates from the formation or unit by which it is to be used, and services will only be initiated by the Command, Area or District Signals Officer when the demand is due to technical reasons. At the same time, the Signal Officer, as advisor to the D.O.C., Area or other Commander, must bring to his notice the desirability of making proper provision of communication facilities for any new organizations, establishments or defences which are in the process of formation or contemplated in the District or Area concerned.

179. A return of Fixed Signal Services required to be carried out in the Command or District for the fiscal year to follow must be in the hands of the Chief Signal Officer or District Signal Officer respectively not later than Sept. 1st of each year.

180. In addition to the above proposals it is the duty of the Chief Signal Officers or District Signal Officers to bring forward for consideration at this time, all other major Fixed Signal Services which have been brought to attention by Officers of the Command or District staff, Signals Officers and other officials.

181. All proposals are examined at Command or District Headquarters and if they are considered desirable, will be included in the **First Estimate of Fixed Signal Services.**

182. This First Estimate is to be submitted to NDHQ by the first of October of each year and will comprise all Fixed Signal Services for the following fiscal year which the G.O.C.-in-C. or D.O.C. considers in the interest of the Service. A portion not to exceed 10% of the total estimate for the Command or 5% for the District may be shown as Command or District Reserve. The First Estimate will be prepared on Form 505 and supported by such information as is available at this early date. Detailed information is not required unless readily available from records, etc. as in the case of Rented or Leased facilities.

183. When the First Estimates of all Commands and Districts are received at NDHQ, they are examined carefully and the amount which is to be included in the annual Army Estimates is decided upon. The amount for Fixed Signal Services is allotted among the various Commands, Districts and **Headquarters Reserve,** and each Command and District is notified of the sum which, it is anticipated, will be allotted to it.

184. **Headquarters Reserve** is that portion of the whole vote for Fixed Signal Services which is required for special items which have been decided upon at NDHQ and which are of such importance as to require direct supervision from Headquarters; in addition, Headquarters Reserve contains a sum to be allotted as the need arises to Commands and Military Districts for special or urgent services, which could not have been foreseen at the time of compiling the estimate.

185. When the Command or District is notified of the sum available for Fixed Signal Services as explained above, a **Revised** Estimate is made and returned to NDHQ. This should be done by January 1st. The Revised Estimate will usually be less than

the First Estimate and the reduction must be made by postponing or abandoning the less essential services. A Command or District reserve should still be included.

186. Following approval of the Army Estimates the vote (210) for Fixed Signal Services is generally that sum previously decided upon, and referred to in para. 183 above. If it should be reduced, a further reduction in each Command, or Military District, Revised Estimate will be necessary.

187. Typical First and Revised Estimates are illustrated in Appendix "E", together with functional charts showing routing of estimates, etc.

188.-190.

SECTION II. (Allotment and Control of Funds)

191. The approved funds for Fixed Signal Services are allotted to Primary 94 under control of the Director of Signals. These funds are broken down at NDHQ to meet the following major requirements of Fixed Signal Services in Canada.

(a) **Army Provision Telephone, Teletype Wireless**

Item	Service or Requirement	Amount
1.	Telephone Construction	
2.	Wireless Construction	
3.	Telephone and Teletype Maintenance	
4.	Wireless Maintenance	
5.	Telephone, Teletype and Miscellaneous Equipment	
6.	Wireless Equipment	

(b) **Rented or Leased Telephone and Teletype**

Item	Service or Requirement	Amount
1.	Telephone Facilities	
	(a) Switchboards and Associated Lines and Equipment ($)	
	(b) Individual Telephones including Key Equipment ($)	
	(c) Private Lines ($)	
	(d) Pole Line Attachments ($)	
	(e) Telephone L.D. Toll ($)	
	(f) Telegrams ($)	
2.	Teletype Lines and Equipment	

(c) **Local Purchase**

Item	Service or Requirement	Amount
1.	Local purchase Tel. and Wireless	

(d) **Command, District or NDHQ Reserve**

Item	Service or Requirement	Amount
1.	Reserve	

192.-194.

SECTION III. (Financial Encumbrances)

195. Following approval by the Chiefs of Staff of the Revised Estimates authority for actual expenditure is obtained by means of Financial Encumbrances.

196. Financial encumbrances to cover Command or District Telephone and Wireless Construction, Telephone Maintenance, Local Purchase Line and Wireless, and Rented or Leased facilities will be raised automatically at NDHQ, and forwarded to the Command, or District concerned, as early as possible in the new fiscal year.

197. The Construction F.E. will only include funds for such items as are detailed in the Revised Estimates. As new construction projects which are covered in the

Revised Estimates, but not detailed due to insufficient information at the time of preparation, become a reality, proper detailed estimates will be submitted, and if approved, existing construction F.E. will be increased by the amount required — funds being taken from the Headquarters Reserve.

198. New plant expansion or construction projects, which are an obvious result of new policy introduced since the Revised Estimates were prepared, will be submitted in a detailed estimate form, and if approved, the existing construction F.E. will be increased by the required amount—funds being taken from the Headquarters Reserve.

199. All construction funds within a Command are controlled and accounted for by the Chief Signal Officer. Since procurement of Fixed Signal Service Equipment is arranged for in bulk by NDHQ, no Financial Encumbrances to cover purchase of equipment will be forwarded to Commands or Districts. However, local purchases of equipment in limited quantities will be allowed, where an urgent **operational** necessity exists. Funds for purchase of the equipment will be taken from the Command or District Reserve on approval of the G.O.C.-in-C. or D.O.C.

200. No Financial Encumbrance will be forwarded to the Commands or Districts to cover Wireless Maintenance since all replacement parts, etc. for both Service pattern and Commercial pattern equipments will be provided by Ordnance on a continuing supply basis.

201. Funds to cover Command or District Reserves will be made available in the Commands and Districts. The G.O.C.-in-C. may authorize expenditures out of Command or District Reserve when the amount is between $250. and $500. The G.O.C. or D.O.C. may authorize expenditures out of District Reserves when the amount is between $50. and $250. These Reserves are to be used in cases where the requirement is urgent or operational necessity demands that such action be taken. Local F.E.'s are raised as required in the District concerned.

202. Command, Area or District Signal officers may authorize expenditures, out of Local Purchase F.E. for Minor Line or Wireless Construction or Maintenance Items, when the amount is less than $50. It will be noted that the total amount which can be expended in this manner is limited by the controlling F.E. No increases will be considered for this F.E. during the fiscal year but increased or decreased amounts may be requested in the "First Estimates". Local Purchase funds are provided in order to allow minor purchases of items which are required immediately and cannot be provided through the normal channels.

203. Local purchase authority must not be utilized for projects which can be estimated for in the proper manner.

204. Two blanket F.E.'s will be forwarded to Commands and/or Districts to cover all Rented or Leased Communication Facilities.

(a) **Telephone Facilities**

This F.E. will be broken down by R.C. Signals for accounting purposes as follows:—

(i) Switchboards and associated lines and equipment.
(ii) Individual Telephones, including key equipments, etc.
(iii) Private Lines.
(iv) Pole Line Attachments.
(v) Telephone Long Distance Toll.
(vi) Telegrams.

(b) **Teletype Lines and Equipment**

This F.E. will only be forwarded to Commands since the Districts' teletype accounts are controlled from NDHQ.

In the above blanket F.E.'s sufficient funds will be available to cover estimated yearly commitments as well as a balance for additional requirements as authorized. Additional funds will be made available as an increase in the Rented or Leased Communications F.E.'s if required for new authorized installations.

205. Headquarters F.E.'s will be raised from time to time for projects in the Commands or Districts which are of such importance as to require direct supervision from NDHQ. All charges against this type of F.E. are paid at NDHQ, however, Local Accounting and certification of invoices will be required in the Command or District concerned.

206.-209.

SECTION IV. (Placing of Orders or Contracts for Construction and Maintenance (Army Provision)

210. Fixed Signal Services which are classified as an "Army Provision" will be undertaken by the Command or District Signals in so far as possible.

211. On receipt of Construction or Maintenance F.E.'s the C.S.O., D.S.O. or Camp Signal Officer will prepare orders and forward to the Local Agent of the Department of Munitions and Supply, together with a copy of F.E., for purchase action. In due course, Acceptance of Tenders will be received covering the items ordered and showing the Firm's name and delivery schedule.

212. If Pole or Pin space rentals are involved in any particular construction project, local arrangements are made to obtain required permission and a covering agreement signed by the Commercial Communication Company concerned. All copies of the agreement are to be forwarded to NDHQ for signature and seal of the Department.

213. All Fixed Signal Services major construction projects (over $10,000.) which require the services of a contractor are handled as a special project by NDHQ. (These Projects are invariably of a Joint Services nature.) In Eastern Canada the Department of M. and S. is charged with arranging for the necessary tenders to be issued and the required Contracts, etc. Funds required are provided by the Dept. of M. and S. who also take title to such plant which is financed by the Department in favour of the Crown. The Department of Munitions and Supply will also assume the responsibility for payment of pole or pin space rental and maintenance of Crown facilities and at the end of the fiscal year debit the service(s) concerned with their proportionate share of the cost.

214. All approved Fixed Signal Services construction projects (under $10,000.) which require the services of a contractor, such as a commercial telephone company, are handled in the Command or District directly with the Company concerned. Projects costing over $5,000. will require the approval of the Dept. of Munitions and Supply. This approval is arranged at NDHQ at the time of submission.

215. From time to time RCE assistance is required in connection with various projects such as:

(a) Erection of concrete test pits for cable terminations.

(b) Drilling or breaking of concrete for Signals ducts, etc.

(c) Digging of trenches for buried cable.

When it is considered advisable to take advantage of RCE and Civilian personnel employed on similar work for Engineer Services, funds may be made available from the labour portion of the Construction F.E. The preparation of estimates and provision of funds for all work carried out by the R.C.E. will remain a signals responsibility.

216. Local Purchase—Line and Wireless Material—Orders for materials will be signed by the C.S.O. Command, Area, or District Signal Officer prior to being passed to contractor. In the Commands, copies of all local Purchase Orders must be made available to the C.S.O. Form MFC 519A will be utilized for all Local Purchase orders.

217.-219.

SECTION V. (Accounting, Invoices and Records for F.S.S. Construction and Maintenance (Army Provision)

220. Copies of all Orders for material will be retained on an order file and numbered consecutively from one, at the beginning of each fiscal year.

221. In order to simplify accounting, a special form F.A.73G has been developed which provides for detailed recording and accounting of Orders, Acceptances of Tenders, Invoices and Date passed for Payment.

222. The following Records must be maintained. **F.E. Register**—An F.E. Register is to be maintained in all Signals headquarters which deal with F.E.'s under the following heading:

M.D.
Date
Authority
F.E. Number
Description
Establishment
Vote
Primary
Object
Amount
Net Adjustment
Final Expenditure
Sub-columns for current adjustments.

Headquarters Financial Encumbrances will be entered as received, in a space apart

Local F.E.'s will be entered as raised and given a consecutive number in the local F.E. series.

As adjustments to the F.E. are made or received, these will be entered in the sub-columns.

When the F.E. has been completed, the total actual payments made by Treasury will be shown, together with the net adjustment, whether increase or saving.

Acceptance of Tender Register—An Acceptance of Tender Register will be maintained, in which will be entered all Acceptance of Tender as received, under the following headings:—

Date
Accept. of T. Number
F.E. Number
C.D. Number
Name of Firm
Total Amount
Sub-columns for amendments

Invoice Register—All invoices, from whatever source, are to be entered as received in the Invoice Register, under the following headings:—

Date
F.E. Number
Accept. of T. Number
Name
Invoice Number
Amount of Invoice
Adjustment
Payment

The amount of the Payment and the Adjustment is eventually to be obtained from Treasury, as explained elsewhere in these instructions.

ACCOUNTS

223. Invoices for articles purchased or services performed will be submitted on the form regularly used by the individual or firm for the rendering of their accounts.

224. Invoices must show the F.E. number, and if by M. and S. contract the C.D. number and Acceptance of Tender number also. Invoices must also show consignee and destination, terms of delivery, and method of packing. If freight charges are included, the Invoice must be supported by a receipted copy of the Carrier's bill.

225. Invoices covering Accounts contracted through the Department of Munitions and Supply are to be submitted as follows:—5 copies direct from firm to consignee who retains one copy and forwards 4 certified copies to the C.S.O., who recommends payment and retains one copy and forwards three copies to the District Treasury Officer, who forwards one copy to the Auditor General and one copy to the Local Stores audit Officer.

226. Invoices covering Local Purchases which do not require M. and S. approval are submitted in quintuplicate to the Consignee who retains a copy and forwards 4 certified copies to the C.S.O., who recommends payment and retains one copy and forwards three copies to Treasury.

227.

CERTIFICATION OF INVOICES

228. Invoices covering the purchase of Stores for ledger charge which are passed by Consignee for recommendation of payment are to be certified as follows:—

I certify that the articles specified in this account have been received in good condition, that the quality and prices are according to contract authorized by.....or, if not by contract, that the prices charged are fair and just. The quantities received have been taken on charge in.....Station Account.....by Certificate Receipt Voucher.....dated.....and no item in this account has been previously certified by me for payment. I recommend payment.

229. Invoices covering the completion of services which are passed by the D.S.O. for recommendation of payment are to be certified as follows:—

I certify that the services specified in this account have been satisfactorily performed, that they were necessary in the interest of the public, and that the charges made are in accordance with contract or agreement, or, if not by contract, the charges are fair and just. That no item in this account has been previously certified by me for payment. I recommend payment.

230. Invoices covering the receipt of Stores issued direct to Works which are passed by the D.S.O. for recommendation of payment are to be certified as follows:—

"I certify that the articles specified in this account have been received in good condition and have been issued direct to works; that the quality and prices are fair and just and that no item in this account has been previously certified by me for payment. I recommend payment."

231. Invoices which are passed by the C.S.O. for payment, are to bear the following stamp:—

Payment Recommended.

232. All copies of Invoices must be classified on the back, with the complete Coding shown on the Financial Encumbrance which authorizes the Expenditure. A Rubber Stamp is provided for this purpose.

233. A separate Invoice must be obtained for the expenditure against each Financial Encumbrance, and each Acceptance of Tender.

234.-244.

SECTION VI. (Placing Orders or Contracts for Rented or Leased Facilities

245. Orders or contracts for Army rented or leased telephone facilities which come within the scale of installations, as referred to in Appendix "D", will be placed by the C.S.O.'s, Command or District Signal Officers who are the only officers authorized to deal with the Commercial Communication Companies.

246. In certain cases the renting or leasing of facilities for military purposes involves construction by a Commercial Communication Company. Where it is possible and the Commercial Communication Company concurs, Command or District Signals may be

utilized to assist in construction on authority of the G.O.C.-in-C. or D.O.C. In this manner the charges against the Department are reduced by an amount equal to the man/hours of labour provided by Signals.

247.-250.

SECTION VII. (Accounts, Invoices and Records for Rented or Leased Telephone Facilities)

251. TELEPHONE ACCOUNTS

(a) The Commercial Telephone Company will submit all telephone accounts, which are a charge against Army Services, in quadruplicate to the Signal Officer in the Area for which facilities are provided. This routing is necessary in order to establish a standardized system for submission of accounts together with Long Distance forms and Receiver General Cheques where applicable.

(b) A "Long Distance" form must be made out on completion of every long distance telephone call placed over an Army controlled telephone. All such calls placed through an Army owned or rented switchboard are recorded by the operator on Form No. 411. In all other cases, the officer, or such personnel as are authorized to make long distance calls, will make out a Form 412 on the completion of each call.

(c) The above forms are used to support the payment of associated Commercial Telephone Companies' accounts.

(d) Long Distance forms are illustrated in Appendix "D".

(e) On completion of a careful check made by the Signal Officer concerned all copies of accounts will be forwarded to the C.S.O. or District Signal Officer concerned together with Long Distance forms.

(f) C.S.O.'s and D.S.O. will be the only officers authorized to deal with Treasury in connection with telephone accounts.

252. **Commissions from Pay Telephones**—In accordance with the Consolidated Revenue Act of Canada, revenue accruing from pay telephones, located in any building, barracks, mess, canteens, etc., under jurisdiction of D.N.D., is to be paid to the credit of the Receiver-General of Canada.

Therefore, in order to ensure uniformity in handling of such commissions, C.S.O.'s, Command or District Signal Officers will advise Telephone Companies, operating in their District, that cheques are to be made payable to the Receiver-General and forwarded to Headquarters of the District concerned for deposit as above.

Official telephones should never be used to place personal Long Distance calls unless exceptional circumstances render such a course imperative. These calls tend to increase the traffic load and may seriously interfere with official business.

253. **Personal Long Distance Telephone Calls**—The responsibility for allowing personal Long Distance telephone calls to be made over Army telephone facilities will rest solely with the O.C. of the Unit or Establishment concerned. The collection of such charges as are involved in these personal L.D. telephone calls is also the direct responsibility of the O.C. of the Unit or Establishment. On receipt of telephone accounts from the Commercial Telephone Company, these personal L.D. telephone charges will be deducted from the total and a cheque made out to the Receiver-General of Canada to cover total cost of personal long distance calls. The Receiver-General cheque together with commercial telephone companies accounts and associated Army forms as referred to in sub-para. 251(e) will be forwarded to the nearest Command, Area or District Signal Officer as applies. Where there is no local Army Signal representative the O.C. unit will forward the above to C.S.O. or D.S.O. concerned.

254. **Application for authority to install new or additional Telephone Facilities (Forms 404 and 404A).**

(a) Application Form 404 will be made out in triplicate by the Signal Officer concerned to support every request for telephone service which requires NDHQ authority. All copies will be forwarded to NDHQ and if approved, two copies will be returned for distribution as follows:—

Copy No. 1—To Signal Officer originating application.
Copy No. 2—To District Treasury Officer.

(b) Application Form 404A will be made out in triplicate by the Signal Officer concerned to support every request for telephone service for which provision is authorized by the G.O.C.-in-C., G.O.C. or D.O.C. Following approval these forms will be distributed as follows:—

Copy No. 1—To Signal Officer originating application for Local Record.
Copy No. 2—To District Treasury Officer to support payment of account.
Copy No. 3—To N.D.H.Q. for record purposes.

255. **Equipment, Service Application and Long Distance Forms.**

(a) A complete record of telephone equipment together with monthly rental must be maintained and kept up to date. The following samples of forms which are to be used together with a brief explanation of each are included in Appendix "D". *

Form 407
Form 408
Form 409
Form 410

(b) In order to assist in the preparation of forms dealing with applications for additional facilities and certain returns as required by N.D.H.Q., samples of the following forms and a brief explanation of each are at Appendix "G".

Form 404
Form 404A
Form 405
Form 405A

(c) Long Distance forms—411 and 412 are also included in Appendix "G".

* HQS 8945-2 13Sept44

APPENDIX "A"

1. Communications Route Plan—Pacific Command.
2. Services Landline Communications Diagram—Pacific Command.
3. Communications Route Plan—Atlantic Command.
4. Services Landline Communications Diagram—Atlantic Command.
5. W/T Links—Pacific Command.
6. W/T Links—Atlantic Command.
7. Commercial Cables (Submarine).
8. Army Teletype and Wireless Communications.

COMMERCIAL SERVICES

BRITISH COLUMBIA

ALBERTA

PACIFIC OCEAN

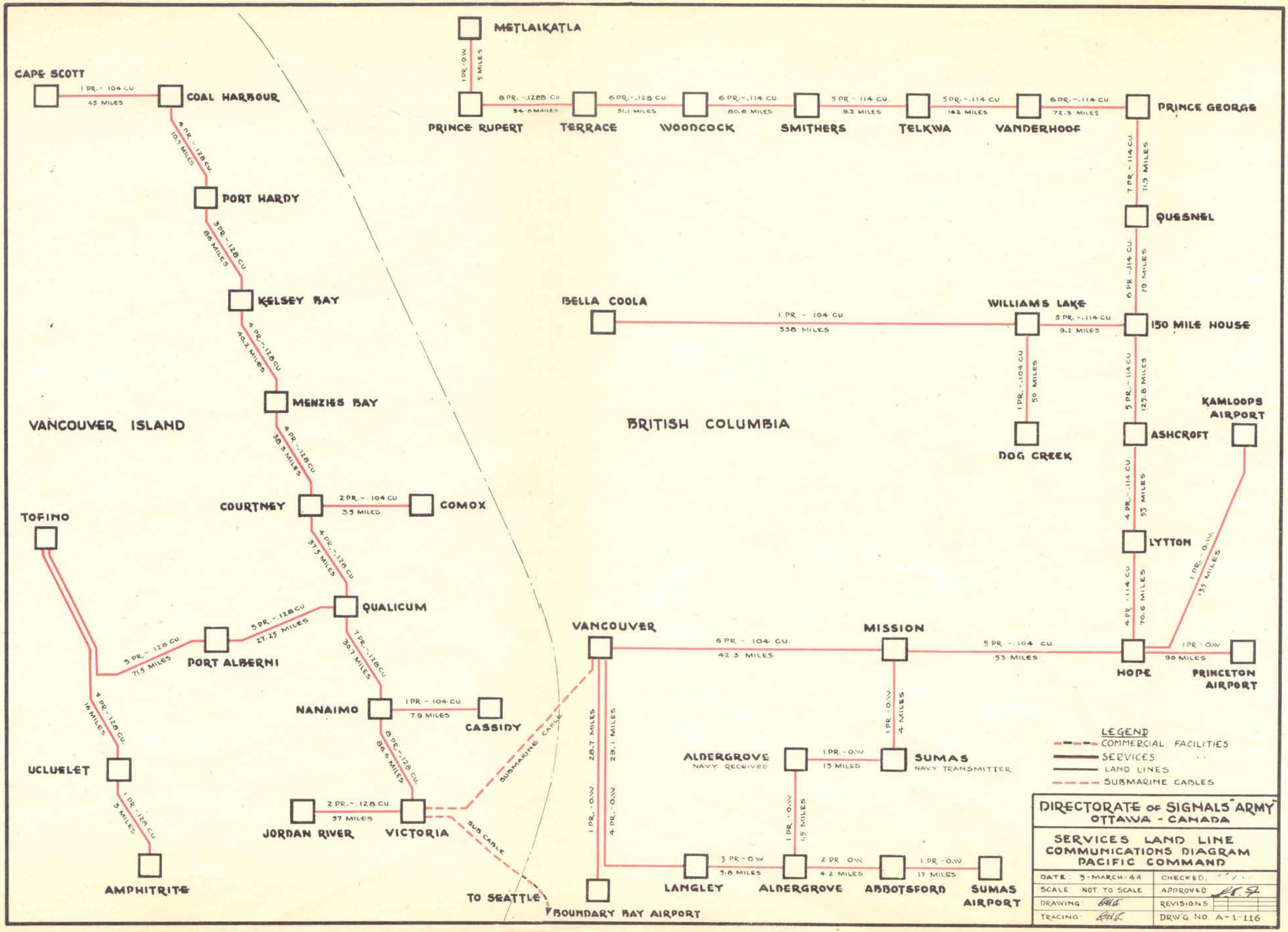
WOODCOCK
SMITHERS
TERRACE
PRINCE RUPERT
BURNS LAKE
VANDERHOOF
PRINCE GEORGE
QUESNEL
BELLA COOLA
WILLIAMS LAKE
150 MILE HOUSE
KLEENA KLEENE
DOG CREEK
REVELSTOKE
PORT HARDY
COAL HARBOUR
CAPE SCOTT
ASHCROFT
KAMLOOPS AIRPORT
VERNON
LYTTON
KELSEY BAY
MENZIES BAY
COMOX
COURTENAY
UNION BAY
NOOTKA
PRINCETON AIRPORT
HOPE
CHILLIWACK
VANCOUVER
QUALICUM JCT
PORT ALBERNI
MISSION
NANAIMO
CASSIDY
SUMAS
ABBOTSFORD
ALDERGROVE
LANGLEY
BOUNDARY BAY
TOFINO
UCLUELET
KOKSILAH
TO SEATTLE
RIVER JORDAN
VICTORIA
UNITED STATES

SECRET

DIRECTORATE OF SIGNALS ARMY
OTTAWA ~ CANADA

COMMUNICATIONS ROUTE PLAN-PACIFIC COMMAND

DATE 13-MAR-44	CHECK: WFH
SCALE 27MI=1IN	APPROVE
DRW'G:	REVISED
TRC'G:	DRW'G NO. A-1-117


METLAIKATLA
1 PR. - O.W.
5 MILES
PRINCE RUPERT
8 PR. - .128 CU.
54.6 MILES
TERRACE
6 PR. - .128 CU.
51.1 MILES
WOODCOCK
6 PR. - .114 CU.
80.6 MILES
SMITHERS
5 PR. - 114 CU.
9.2 MILES
TELKWA
5 PR. - .114 CU.
142 MILES
VANDERHOOF
6 PR. - .114 CU.
72.3 MILES
PRINCE GEORGE
7 PR. - 114 CU.
71.9 MILES
QUESNEL
6 PR. - .114 CU.
79 MILES
150 MILE HOUSE
WILLIAMS LAKE
5 PR. - .114 CU.
9.2 MILES
BELLA COOLA
1 PR - 104 CU.
338 MILES
1 PR. - .104 CU.
50 MILES
DOG CREEK
5 PR. - 114 CU.
123.8 MILES
ASHCROFT
KAMLOOPS AIRPORT
4 PR. - .114 CU.
55 MILES
LYTTON
4 PR. - 114 CU.
70.6 MILES
1 PR. - O.W.
135 MILES
CAPE SCOTT
1 PR. - 104 CU.
45 MILES
COAL HARBOUR
4 PR. - .128 CU.
10.3 MILES
PORT HARDY
3 PR. - 128 CU.
86 MILES
KELSEY BAY
4 PR. - .128 CU.
40.2 MILES
MENZIES BAY
4 PR. - 128 CU.
39.3 MILES
COURTNEY
2 PR. - 104 CU.
3.5 MILES
COMOX
4 PR. - 128 CU.
37.5 MILES
QUALICUM
TOFINO
3 PR. - 128 CU.
71.5 MILES
PORT ALBERNI
3 PR. - 128 CU.
27.25 MILES
4 PR. - 128 CU.
18 MILES
UCLUELET
1 PR. - 128 CU.
3 MILES
AMPHITRITE
7 PR. - 128 CU.
36.7 MILES
NANAIMO
1 PR - 104 CU.
7.9 MILES
CASSIDY
8 PR. - 128 CU.
86.6 MILES
2 PR. - 128 CU.
37 MILES
JORDAN RIVER
VICTORIA
SUBMARINE CABLE
SUB CABLE
TO SEATTLE
VANCOUVER ISLAND
BRITISH COLUMBIA
VANCOUVER
6 PR - 104 CU.
42.3 MILES
MISSION
5 PR - 104 CU.
53 MILES
HOPE
1 PR - O.W.
90 MILES
PRINCETON AIRPORT
1 PR. - O.W.
28.7 MILES
4 PR. - O.W.
29.1 MILES
BOUNDARY BAY AIRPORT
1 PR - O.W.
4 MILES
ALDERGROVE
NAVY RECEIVER
1 PR - O.W.
13 MILES
SUMAS
NAVY TRANSMITTER
1 PR. - O.W.
1.5 MILES
3 PR - O.W.
5.8 MILES
LANGLEY
2 PR O.W.
4.2 MILES
ALDERGROVE
1 PR - O.W.
17 MILES
ABBOTSFORD
SUMAS AIRPORT
LEGEND
COMMERCIAL FACILITIES
SERVICES
LAND LINES
SUBMARINE CABLES
DIRECTORATE of SIGNALS "ARMY"
OTTAWA - CANADA
SERVICES LAND LINE COMMUNICATIONS DIAGRAM PACIFIC COMMAND
DATE: 3-MARCH-44
CHECKED:
SCALE: NOT TO SCALE
APPROVED
DRAWING:
REVISIONS
TRACING:
DRWG NO. A-1-116

SEVEN ISLANDS
ANTICOSTI ISLAND
GULF OF ST. LAWRENCE
ARVIDA
SAGUENAY
ST. LAWRENCE RIVER
CARTIER MT.
GASPE
MONT JOLI
RIMOUSKI
RIVIERE DU LOUP
QUEBEC
WOODSTOCK
CAMPBELLTON
BATHURST
CHATHAM
PRINCE EDWARD ISLAND
CHARLOTTETOWN
SUMMERSIDE
MONCTON
SUSSEX
PENNFIELD
LIAISON WITH U.S. EASTERN SECTOR
ST. JOHN
FUNDY
BAY OF
DEBERT
TRURO
BROOKLYN
DIGBY
YARMOUTH
TUSKET
SHELBURNE
HALIFAX
DARTMOUTH
MULGRAVE
CANSO
CAPE BRETON ISLAND
PORT AUX BASQUE
CAPE NORTH
NORTH SYDNEY
SYDNEY
SECTOR H.Q.
LOUISBURG
STEPHENVILLE
NEWFOUNDLAND
BOTWOOD
LEWISPORT
GANDER
ST. PIERRE
HEARTS CONTENT
HARBOUR GRACE
BAY of ROBERTS
ST. JOHNS
TO VALENCIA
PENZANCE
SENNEN
FAYAL
TO WATERVILLE
TO NEW YORK
TO HAMMEL-N.Y.
TO FAYAL
TO BERMUDA
TO DUXBURY MASS.
TO HAMMEL-N.Y.
ATLANTIC OCEAN

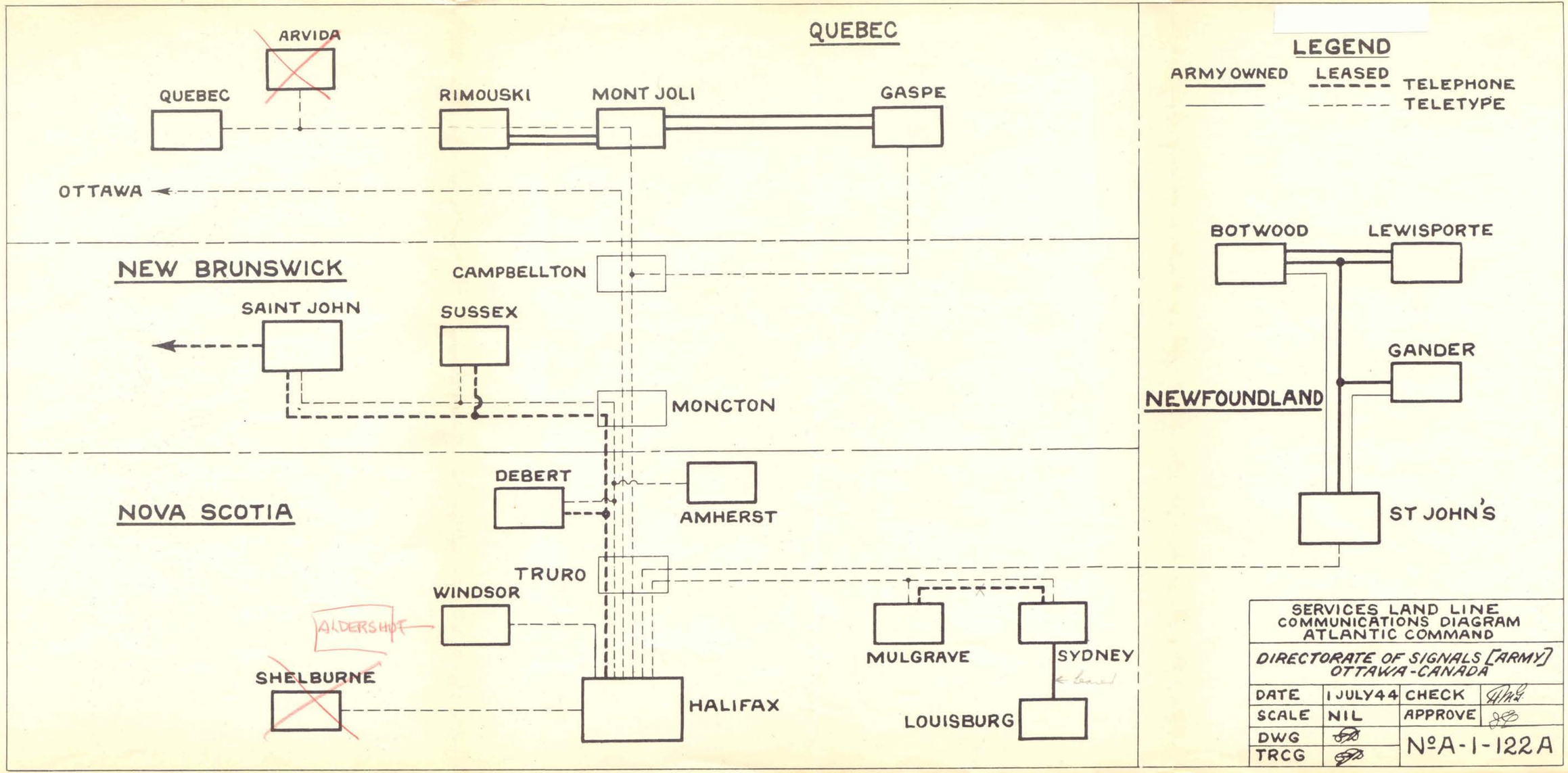
— LEGEND —
COMMERCIAL FACILITIES.
SERVICES FACILITIES.
COMMERCIAL SUB.CABLE FACILITIES.
B.T.Co. - BELL TELEPHONE COMPANY
Q.P.&T. - QUEBEC POWER & TELEPHONE CO.
B. & G. - BONAVENTURE & GASPE TEL. CO.
C.N.T. - CANADIAN NATIONAL TEL. CO.
M.T.&T. - MARITIME TEL. & TEL COMPANY.
W.U. - WESTERN UNION
C.C. - COMMERCIAL CABLES CO.
C.&W. - CABLE & WIRELESS COMPANY
N.B.TEL - NEW BRUNSWICK TELEPHONE CO.

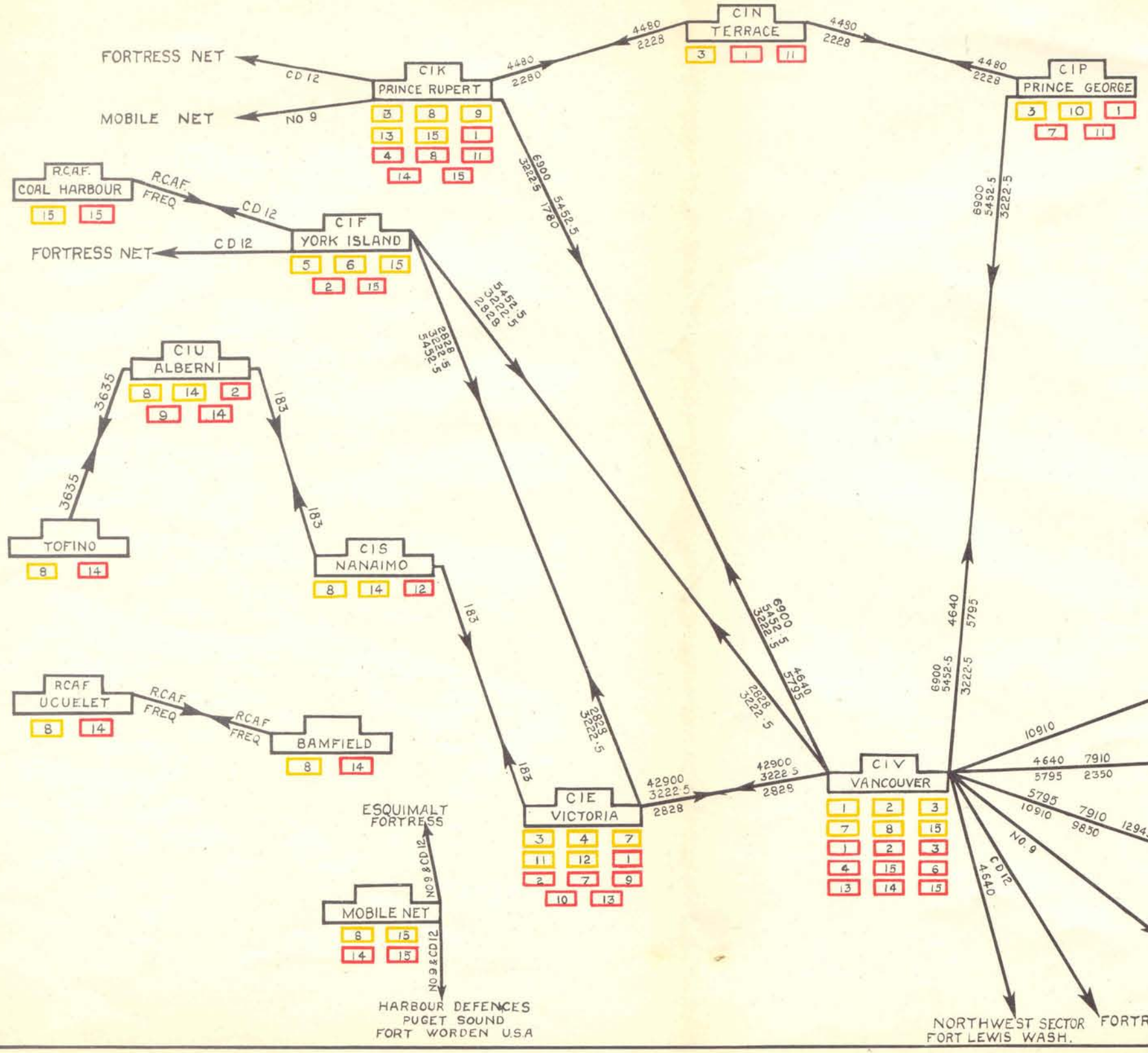
SECRET

DIRECTORATE OF SIGNALS "ARMY"
OTTAWA - CANADA

COMMUNICATIONS ROUTE
PLAN - ATLANTIC COMMAND.

SCALE: 1" = 35 MILES	CHECKED:
DATE: 24-MAR-44	APPROVED:
DRAWING:	REVISED:
TRACING:	DRW'G. NO: A-1-126


QUEBEC
ARVIDA
QUEBEC
RIMOUSKI
MONT JOLI
GASPE
OTTAWA
NEW BRUNSWICK
CAMPBELLTON
SAINT JOHN
SUSSEX
MONCTON
NOVA SCOTIA
DEBERT
AMHERST
TRURO
WINDSOR
ALDERSHOT
SHELBURNE
HALIFAX
MULGRAVE
SYDNEY
LOUISBURG
LEGEND
ARMY OWNED
LEASED
TELEPHONE
TELETYPE
BOTWOOD
LEWISPORTE
GANDER
NEWFOUNDLAND
ST JOHN'S
SERVICES LAND LINE COMMUNICATIONS DIAGRAM ATLANTIC COMMAND
DIRECTORATE OF SIGNALS [ARMY] OTTAWA-CANADA
DATE 1 JULY 44
CHECK
SCALE NIL
APPROVE
DWG
TRCG
No A-1-122A

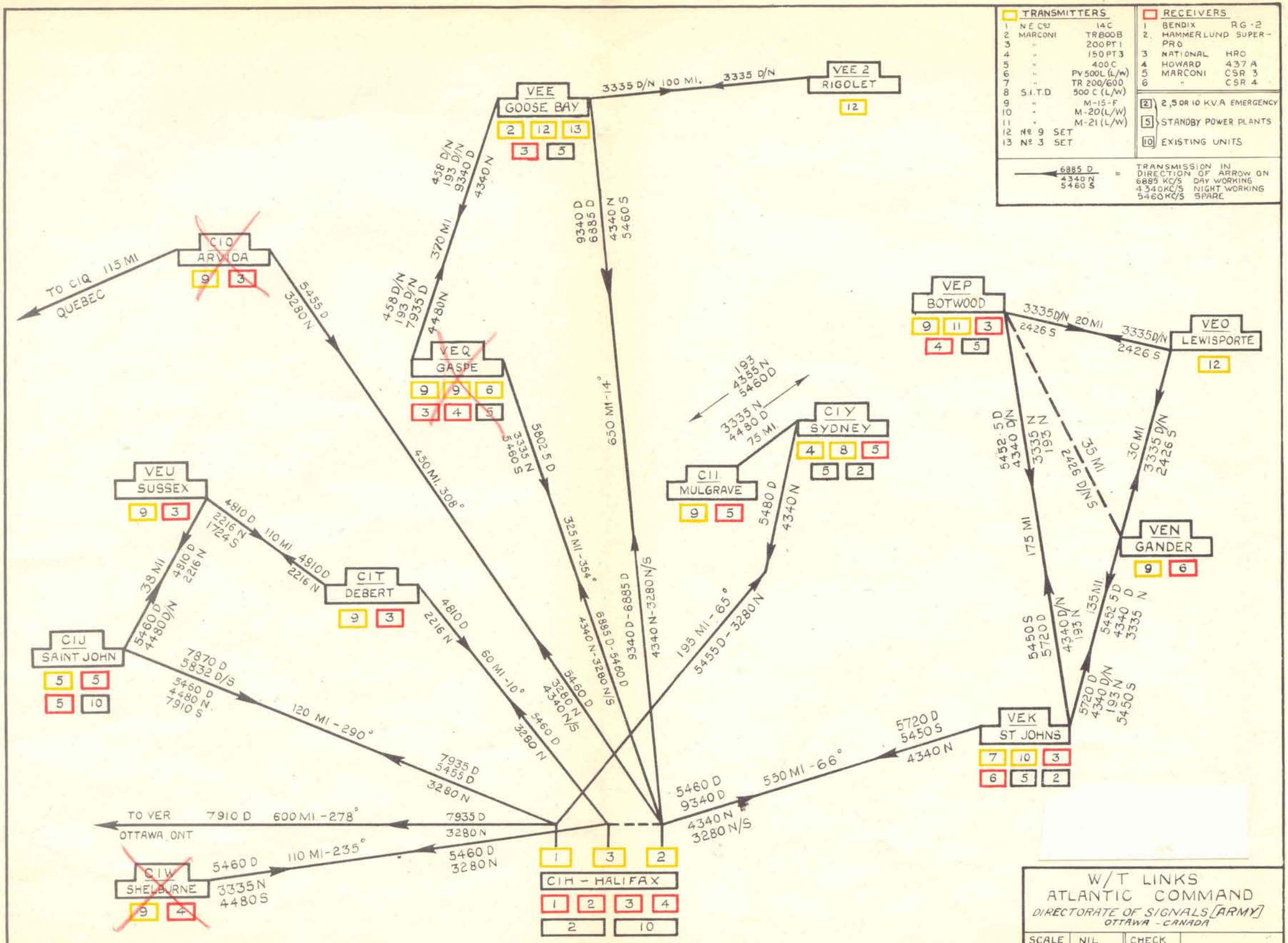


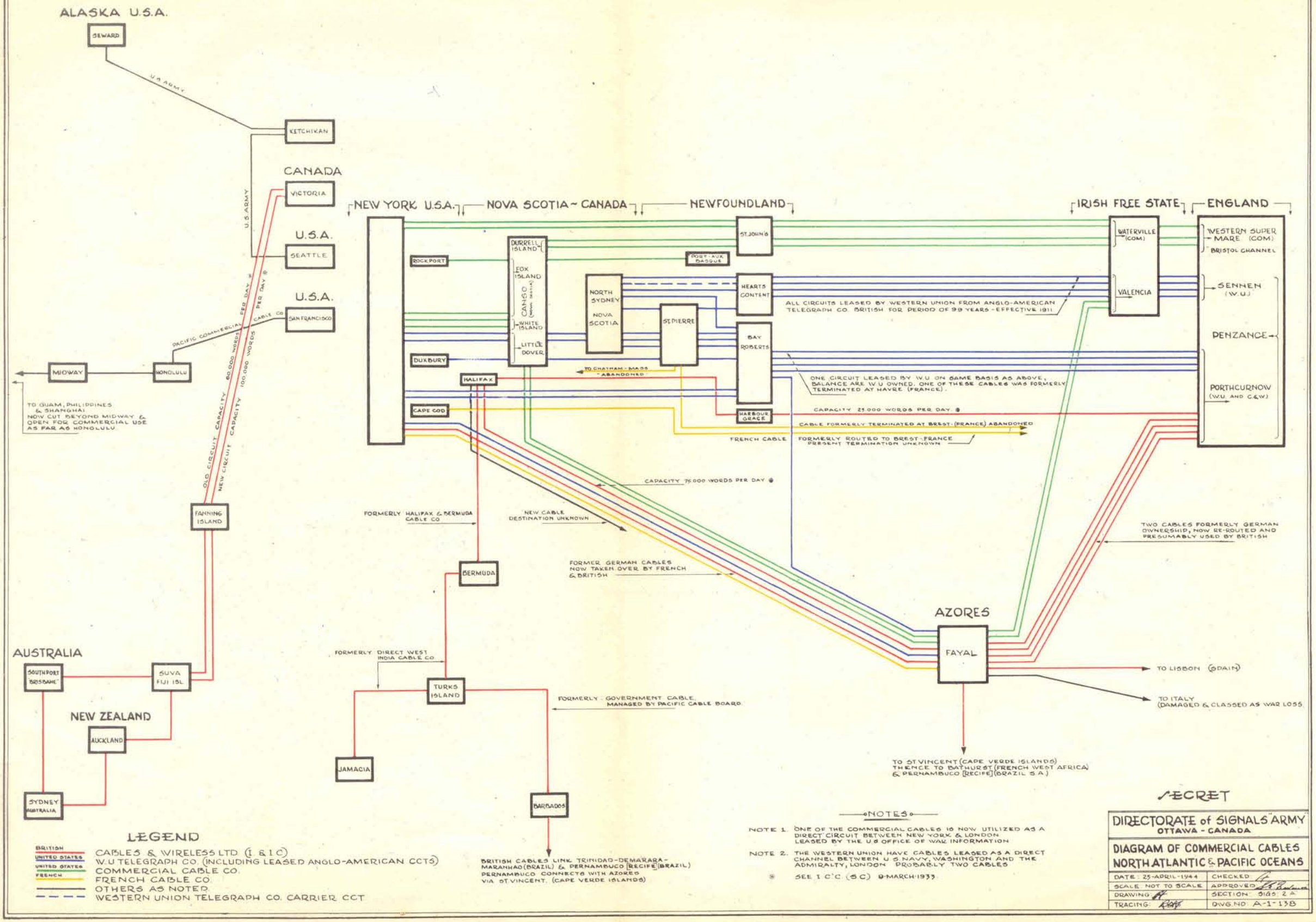
TRANSMITTERS	RECEIVERS
1 LP-200	1 RCA AR 77E
2 LP-21	2 NATIONAL HRO
3 M-15-F	3 NATIONAL 88-XA
4 Nº 5 HP	4 BENDIX MR-7A
5 30 PT	5 MARCONI CSR-2 [MODIFIED]
6 150 T	6 MARCONI CSR-2 [ORIGINAL]
7 250 W FM	7 MARCONI CSR-3
8 Nº 9 SET	8 MARCONI CSR-4
9 MARCONI LONG WAVE	9 MURPHY R-106
10 MARCONI 400W 4-CHANNEL	10 HALLICRAFTERS SX-25
11 MARCONI 1 KW	11 HALLICRAFTERS SX-28
12 WESTERN ELECTRIC 14 C	12 RCAF 1082
13 ACS COMMERCIAL 4-CHANNEL	13 GEN ELECTRIC FM 90
14 CSEE 500 CLW	14 Nº 9
15 CD 12	15 CD 12

4480 / 2228 = TRANSMISSION IN DIRECTION OF ARROW ON 4480 & 2228 KC

W/T LINKS
PACIFIC COMMAND
DIRECTORATE OF SIGNALS [ARMY]
OTTAWA – CANADA

SCALE	NIL	CHECK	
DATE	21-MAR 44	APPROVE	
DWG		Nº	A-1-120
TRC'G			


TRANSMITTERS
1 N.E.Co. 14C
2 MARCONI TR800B
3 " 200PT1
4 " 150PT3
5 " 400C
6 " PV500L (L/W)
7 " TR 200/600
8 S.I.T.D 500 C (L/W)
9 " M-15-F
10 " M-20(L/W)
11 " M-21(L/W)
12 Nº 9 SET
13 Nº 3 SET
RECEIVERS
1 BENDIX RG-2
2 HAMMERLUND SUPER-PRO
3 NATIONAL HRO
4 HOWARD 437A
5 MARCONI CSR 3
6 " CSR 4
2 2,5 OR 10 KV.A EMERGENCY
5 STANDBY POWER PLANTS
10 EXISTING UNITS
6885 D / 4340 N / 5460 S = TRANSMISSION IN DIRECTION OF ARROW ON 6885 KC/S DAY WORKING 4340KC/S NIGHT WORKING 5460KC/S SPARE
VEE GOOSE BAY
VEE 2 RIGOLET
3335 D/N 100 MI.
3335 D/N
CIO ARVIDA
TO CIQ 115 MI QUEBEC
5455 D 3280 N
458 D/N 193 D/N 9340 D
4340 N
370 MI.
458 D/N 193 D/N 7935 D
4480 N
VEQ GASPE
9340 D 6885 D
4340 N 5460 S
650 MI-14°
5802.5 D
3335 N 5460 S
450 MI. 308°
193 4355 N 5460 D
3335 N 4480 D
75 MI.
CIY SYDNEY
CII MULGRAVE
5480 D
4340 N
VEP BOTWOOD
3335 D/N 20 MI
2426 S
3335 D/N 2426 S
VEO LEWISPORTE
5452.5 D 4340 D/N
3335 N 193
35 MI
2426 D/N S
30 MI
3335 D/N 2426 S
VEN GANDER
175 MI
135 MI
5450 S 5720 D
4340 D/N 193 N
5452.5 D 4340 D 3335 N
5720 D 4340 D/N 193 N 5450 S
VEU SUSSEX
4810 D 2216 N 1724 S
110 MI
4810 D 2216 N
CIT DEBERT
38 MI
4810 D 2216 N
5460 D 4480 D/N
CIJ SAINT JOHN
7870 D 5832 D/S
5460 D 4480 N 7910 S
120 MI - 290°
4810 D 2216 N
60 MI - 10°
5460 D 3280 N
7935 D 5455 D 3280 N
325 MI - 354°
6885 D - 5460 D 4340 N - 3280 N/S
9340 D - 6885 D 4340 N - 3280 N/S
5460 D 3280 N 4340 N/S
195 MI - 65°
5455 D - 3280 N
5460 D 9340 D 4340 N 3280 N/S
550 MI - 66°
5720 D 5450 S 4340 N
VEK ST JOHNS
TO VER OTTAWA ONT
7910 D 600 MI - 278°
7935 D 3280 N
CIW SHELBURNE
5460 D 110 MI - 235°
3335 N 4480 S
5460 D 3280 N
CIH - HALIFAX
W/T LINKS
ATLANTIC COMMAND
DIRECTORATE OF SIGNALS [ARMY]
OTTAWA - CANADA
SCALE NIL
DATE 13 MAR 44
DWG
TRC'G
CHECK
APPROVE
Nº A-1-118

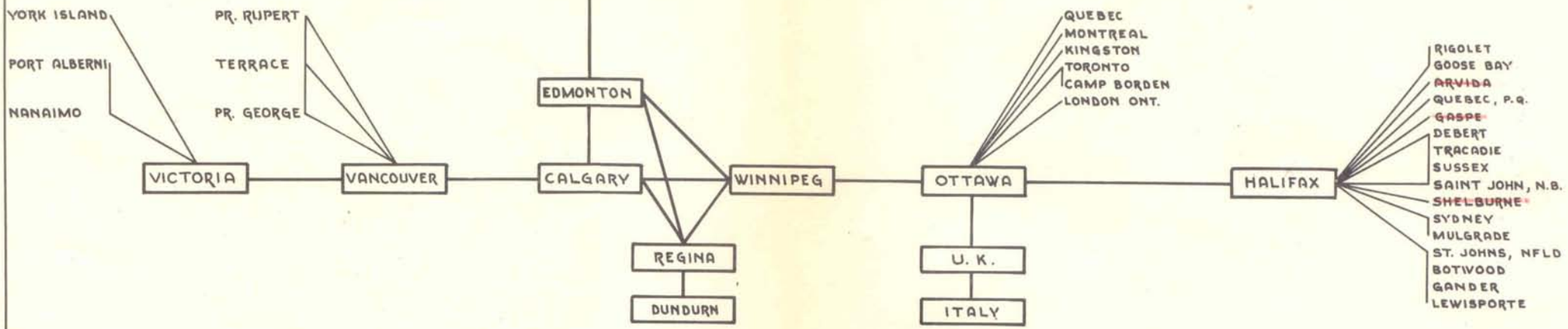

ALASKA U.S.A.
SEWARD
U.S. ARMY
KETCHIKAN
CANADA
VICTORIA
U.S.A.
SEATTLE
U.S.A.
SAN FRANCISCO
U.S. ARMY
PACIFIC COMMERCIAL CABLE CO
OLD CIRCUIT CAPACITY 60,000 WORDS PER DAY ®
NEW CIRCUIT CAPACITY 100,000 WORDS PER DAY ®
MIDWAY
HONOLULU
TO GUAM, PHILIPPINES & SHANGHAI NOW CUT BEYOND MIDWAY & OPEN FOR COMMERCIAL USE AS FAR AS HONOLULU
FANNING ISLAND
AUSTRALIA
SOUTHPORT BRISBANE
SUVA FIJI ISL
NEW ZEALAND
AUCKLAND
SYDNEY AUSTRALIA
NEW YORK U.S.A.
NOVA SCOTIA ~ CANADA
NEWFOUNDLAND
IRISH FREE STATE
ENGLAND
ROCKPORT
DURRELL ISLAND
FOX ISLAND
CANSO
WHITE ISLAND
LITTLE DOVER
DUXBURY
HALIFAX
CAPE COD
NORTH SYDNEY NOVA SCOTIA
ST PIERRE
TO CHATHAM - MASS - ABANDONED
ST JOHN'S
PORT-AUX-BASQUE
HEARTS CONTENT
BAY ROBERTS
HARBOUR GRACE
ALL CIRCUITS LEASED BY WESTERN UNION FROM ANGLO-AMERICAN TELEGRAPH CO. BRITISH FOR PERIOD OF 99 YEARS - EFFECTIVE 1911
ONE CIRCUIT LEASED BY W.U. ON SAME BASIS AS ABOVE, BALANCE ARE W.U. OWNED. ONE OF THESE CABLES WAS FORMERLY TERMINATED AT HAVRE (FRANCE).
CAPACITY 25,000 WORDS PER DAY ®
CABLE FORMERLY TERMINATED AT BREST-(FRANCE) ABANDONED
FRENCH CABLE
FORMERLY ROUTED TO BREST-FRANCE PRESENT TERMINATION UNKNOWN
CAPACITY 76,000 WORDS PER DAY ®
FORMERLY HALIFAX & BERMUDA CABLE CO
NEW CABLE DESTINATION UNKNOWN
BERMUDA
FORMER GERMAN CABLES NOW TAKEN OVER BY FRENCH & BRITISH
WATERVILLE (COM)
VALENCIA
WESTERN SUPER MARE (COM)
BRISTOL CHANNEL
SENNEN (W.U.)
PENZANCE
PORTHCURNOW (W.U. AND C&W)
TWO CABLES FORMERLY GERMAN OWNERSHIP, NOW RE-ROUTED AND PRESUMABLY USED BY BRITISH
AZORES
FAYAL
TO LISBON (SPAIN)
TO ITALY (DAMAGED & CLASSED AS WAR LOSS)
TO ST VINCENT (CAPE VERDE ISLANDS) THENCE TO BATHURST (FRENCH WEST AFRICA) & PERNAMBUCO [RECIFE] (BRAZIL S.A.)
FORMERLY DIRECT WEST INDIA CABLE CO
TURKS ISLAND
FORMERLY GOVERNMENT CABLE, MANAGED BY PACIFIC CABLE BOARD
JAMACIA
BARBADOS
BRITISH CABLES LINK TRINIDAD-DEMARARA-MARANHAO (BRAZIL) & PERNAMBUCO [RECIFE (BRAZIL) PERNAMBUCO CONNECTS WITH AZORES VIA ST VINCENT. (CAPE VERDE ISLANDS)
LEGEND
BRITISH
UNITED STATES
UNITED STATES
FRENCH
CABLES & WIRELESS LTD (I & C)
W.U TELEGRAPH CO. (INCLUDING LEASED ANGLO-AMERICAN CCTS)
COMMERCIAL CABLE CO.
FRENCH CABLE CO.
OTHERS AS NOTED.
WESTERN UNION TELEGRAPH CO. CARRIER CCT
NOTES
NOTE 1. ONE OF THE COMMERCIAL CABLES IS NOW UTILIZED AS A DIRECT CIRCUIT BETWEEN NEW YORK & LONDON LEASED BY THE U.S OFFICE OF WAR INFORMATION
NOTE 2. THE WESTERN UNION HAVE CABLES LEASED AS A DIRECT CHANNEL BETWEEN U.S NAVY, WASHINGTON AND THE ADMIRALTY, LONDON PROBABLY TWO CABLES
® SEE I.C.C. (S.C) 9-MARCH-1933
SECRET
DIRECTORATE of SIGNALS ARMY
OTTAWA - CANADA
DIAGRAM OF COMMERCIAL CABLES NORTH ATLANTIC & PACIFIC OCEANS
DATE: 25-APRIL-1944
CHECKED
SCALE: NOT TO SCALE
APPROVED
DRAWING:
SECTION: SIGS 2A
TRACING:
DWG.NO: A-1-138

WIRELESS

SECRET

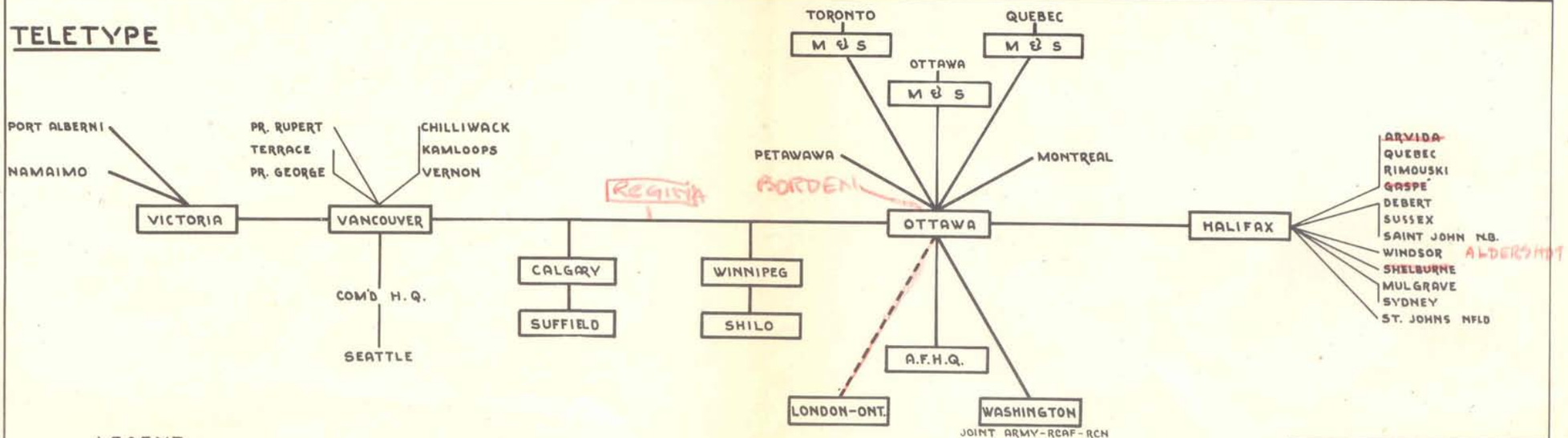
N.W.T. & Y. RADIO SYSTEM

AKLAVIK	RADIUM [REOPENING 1944]
CHIPEWYAN	GOODHOPE [PROJECTED 1944]
DAWSON	NORMAN WELLS
EDMONTON	PROVIDENCE
FT. SMITH	RESOLUTION
MAYO	SIMPSON
McMURRAY	YELLOW KNIFE
NORMAN	WHITE HORSE



CANADIAN ARMY COMMUNICATIONS W/T 1 MAY 44

TELETYPE



LEGEND

ARMY T/T COMMUNICATIONS ——— IN OPERATION

" " " ------ PROJECTED

CANADIAN ARMY COMMUNICATIONS T/T 1 MAY 44

REVISION OF Nº C-1-63 OF 1 FEB 44			
DIRECTORATE OF SIGNALS [ARMY] OTTAWA ..... CANADA			
SCALE	NONE	CHECK	
DATE	1 MAY 44	APPROVE	
DWG	TD	Nº C-1-63	
TRCG	TD		

CANADIAN ARMY SIGNAL SYSTEM — TELETYPE.

RESTRICTED

— LEGEND —

- A 15 — ARMY OWNED PAGE MACHINE #15
- C.N. 15 — LEASED PAGE MACHINE #15 C.N. TELEGRAPH
- R.C. 15 — OWNED AND MAINTAINED BY R.C.A.F.
- A.A.T. 15 — LEASED FROM ANGLO-AMER. TEL. CO. BY R.C.A.F.
- ARMY — ARMY OR NAVY CIRCUIT.

ARMY PACIFIC SIGNAL SYSTEM "TELETYPE"

PRINCE RUPERT — TERRACE — PRINCE GEORGE — COLQUITZ — ALBERNI — NANAIMO — ESQUIMALT "WORK POINT" — NAVY YARD — CHILLIWACK — KAMLOOPS — VERNON — JERICHO BEACH — W.A.C. — R.C.N. H.Q. — BLAINE "WASHINGTON" — SEATTLE — VANCOUVER

NOTE:— ARMY OWNED MODEL 15 T/T MACHINES — 26.
ARMY OWNED MODEL 19 T/T MACHINES — 6.
INCLUDING { 1-A 15 ON LOAN AT WAINWRIGHT. 1-A 19 ON LOAN AT CALGARY.

ARMY CENTRAL SIGNAL SYSTEM "TELETYPE"

CAMP BORDEN — LONDON C.M.D. — PETAWAWA — KINGSTON — TORONTO — LONGUE POINTE MONTREAL — GRANDE PRAIRIE — EDMONTON — REGINA — CALGARY — WINNIPEG — SHILO — SUFFIELD — WAINWRIGHT — D.M.I. OFFICE — LEITRIM — M.G.O. — MOVEMENT CONTROL — R.C.A.F.-H.Q. — WASHINGTON — NEW YORK — OTTAWA

NOTE:— ARMY OWNED MODEL 15 T/T MACHINES — 25
ARMY OWNED MODEL 19 T/T MACHINES — 8
ARMY OWNED MODEL 14 REPERFORATORS — 6

INCLUDING:— 6 A 15 ON LOAN TO C.S.T.C.
1 A 15 ON LOAN TO EXP. STATION "SUFFIELD"
1 A 19 ON LOAN TO NAVY & 1 A 19 TO C.S.R.D.E.
1 A 15 ON LOAN TO L.P.O.D.
1 A 14 ON LOAN TO L.P.O.D.

ARMY ATLANTIC SIGNAL SYSTEM "TELETYPE"

A.S.O. ARVIDA — A.S.O. QUEBEC — RIMOUSKI — CAMPBELLTON — GASPE — BOTWOOD — GANDER — A.S.O. ST. JOHN'S — ST. JOHN — SUSSEX — AMHERST — H.Q. M.D.7. — WINDSOR — MULGRAVE — SYDNEY — DEBERT — EMB. COMDT. — SHELBURNE — R.C. NAVY — DARTMOUTH — EASTERN AIR COMMAND — H.Q. A.C. SIGNALS — A.C.-H.Q. OPS ROOM — H.Q. M.D.6 — HALIFAX

NOTE:— ARMY OWNED MODEL 15 T/T MACHINES — 27.
ARMY OWNED MODEL 19 T/T MACHINES — 2.
ARMY OWNED MODEL 14 REPERFORATORS — 1.

REVISED	DIRECTORATE OF SIGNALS "ARMY" OTTAWA-CANADA.
	CANADIAN ARMY SIGNAL SYSTEM "TELETYPE"
DATE: AUG-20-44.	CHECKED:
SCALE: NONE	APPROVED:
DRAWING:	SECTION: S165-2
TRACING:	DWG. NO. B-1-192

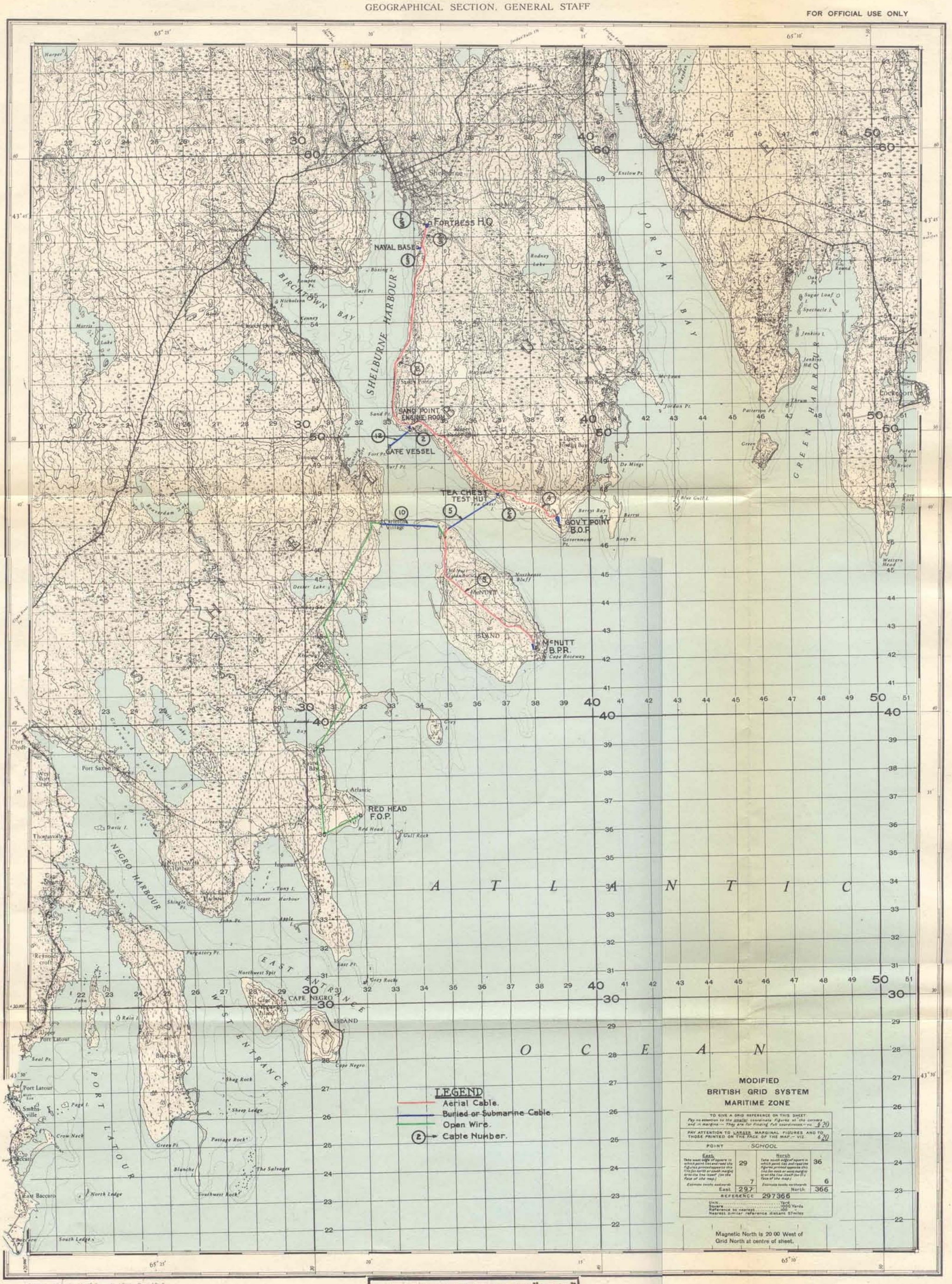
APPENDIX "B"

1. General Route Plan.
2. Cable and Wiring Diagrams, Defended Area.
3. Typical Layout for Fire Command Post.
4. Typical Layout for Fortress Plotting Room and C.P.
5. Conduit and Wiring Plan—B.O.P.
6. Typical Layout—Telephone and Alarm Circuits for Close Defence Battery.
7. Typical Layout—Telephone and Alarm Circuits for Counterbombardment Battery.
8. Typical Layout—Telephone and Alarm Circuits for C.B. Battery with Close Defence Role.
9. Communications Diagram—Fortress Range Finding System using Radar.
10. Cable Layout Plan—Close Defence Battery.
11. Conduit Diagram A/MTB Battery.
12. Typical Conduit Layouts—Radar B.C.P.
13. Steel Rack for Apparatus Loudspeaking.
14. Steel Cabinet for Apparatus L.S., Telephone, Alarm Bell, etc., at Gun Position without Gun Shield.
15. Abbreviations—Fixed Signal Services.
16. Symbols and Abbreviations (Construction).

DEPARTMENT OF NATIONAL DEFENCE

GEOGRAPHICAL SECTION, GENERAL STAFF

FOR OFFICIAL USE ONLY



Surveyed and Reproduced by the Geographical Section, General Staff,
DEPARTMENT OF NATIONAL DEFENCE.
Surveyed 1941, with aerial photography by R.C.A.F.
Published 1942.

REFERENCE

Main Highway (wide) Paved Gravel
Secondary (narrow) Paved Gravel
Other Roads
Path
Highway Route Numbers 3
Railways: Double Track; Single Track; Along Road
Post Office
Telegraph or Telephone Trunk Route
Telegraph Office T
Boundaries: Provincial; County; Township
Electric Power Lines: On Steel Towers; On Wood Poles
Triangulation Station
Cemetery C
Telephone Exchange T

DIRECTORATE OF SIGNALS "ARMY"
OTTAWA - CANADA
GENERAL ROUTE PLAN
DWG. NO. A-1-146.

Scale : 1 mile to 1 inch or 1: 63,360

1,000 0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 Yards
1 0 1 2 3 4 5 Miles

Contour interval 25 feet
All Elevations in Feet above Mean Sea Level.
Magnetic Declination 21°W at centre of sheet, 1942.

REFERENCE

House; Barn; Mill: Saw, Grist or Flour, Cheese, Other Mill or Factory; Quarry; Sand or Gravel Pit; Woods, Deciduous, Coniferous; Church with Spire, without either; School; Manse; Rapids; Bridge; Orchard; Contours; Elevation; Depression; Altitudes; Bench Marks; Cliff; Lighthouse; Submarine Cable; Canal; Locks

THE INCIDENCE OF LETTERS ON THE 6

V	W	X
A	B	C
F	G	H

500, 400, 800, 100,

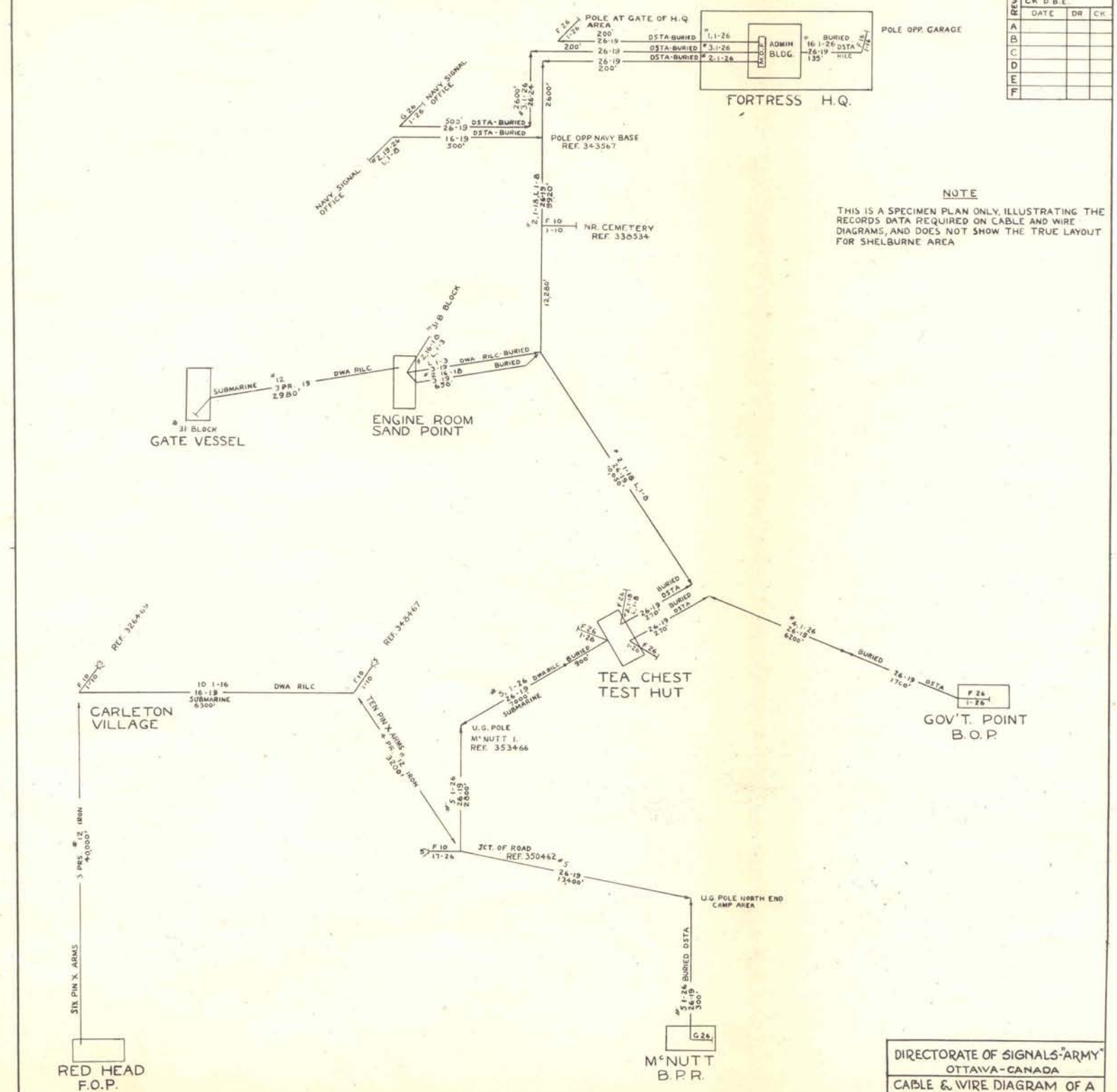
100-5-44(4504)

CABLE AND WIRE DIAGRAM

SECRET

AREA
BTY. or POST
SCALE : NONE

REVISIONS	DATE IN EFFECT 18 MAR 44		
	DR A.H.G. CK D.B.E.		
	DATE	DR	CK
A			
B			
C			
D			
E			
F			

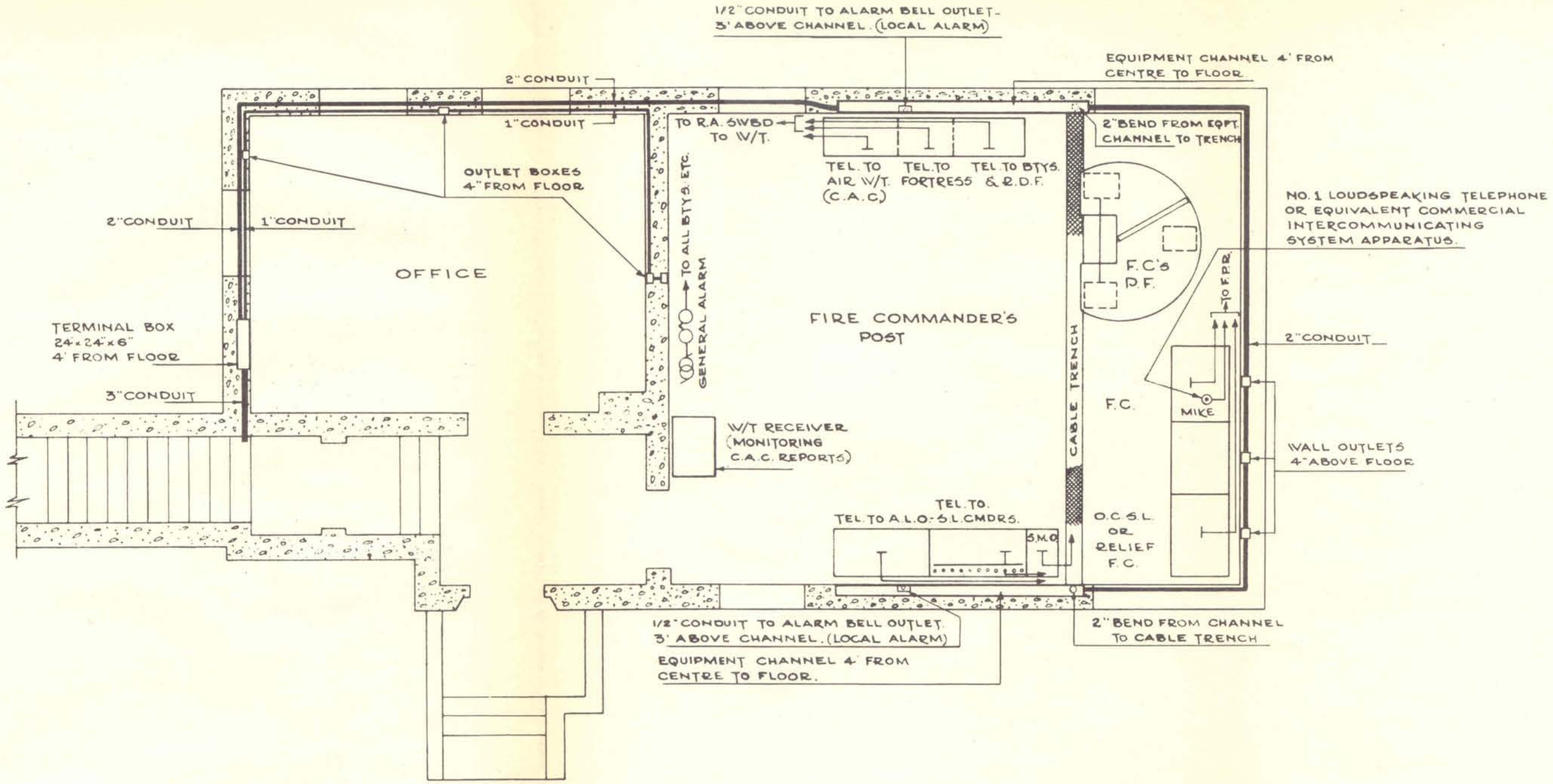


NOTE

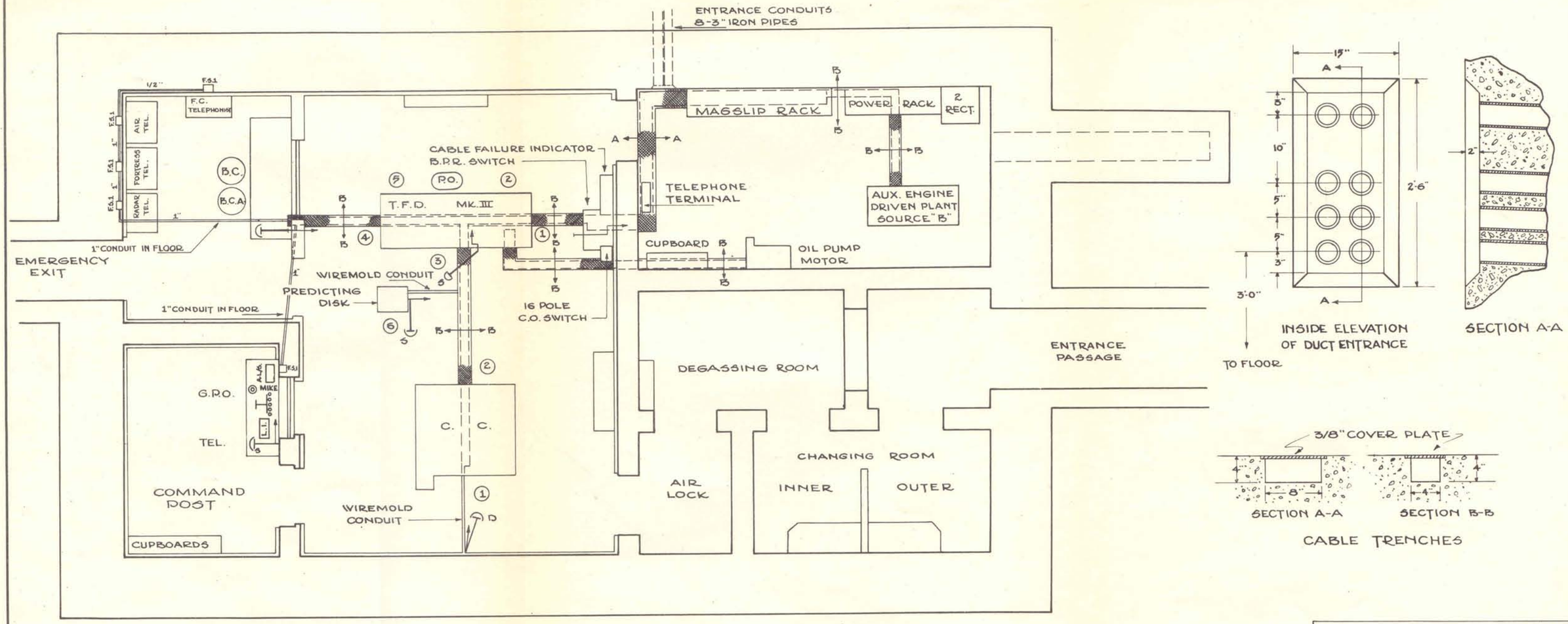
THIS IS A SPECIMEN PLAN ONLY, ILLUSTRATING THE RECORDS DATA REQUIRED ON CABLE AND WIRE DIAGRAMS, AND DOES NOT SHOW THE TRUE LAYOUT FOR SHELBURNE AREA

DIRECTORATE OF SIGNALS "ARMY"
OTTAWA - CANADA

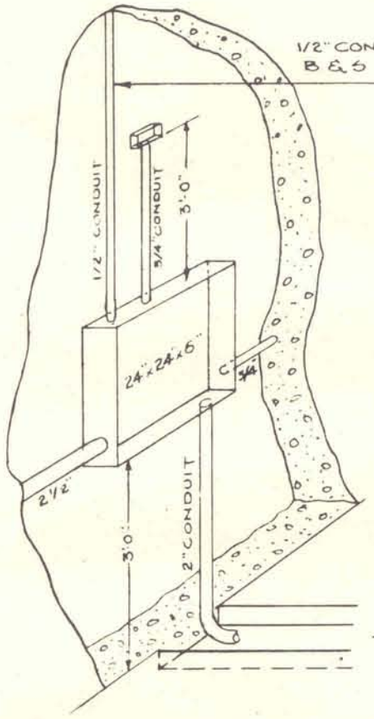
CABLE & WIRE DIAGRAM OF A DEFENDED AREA. - DWG. No B-1-140



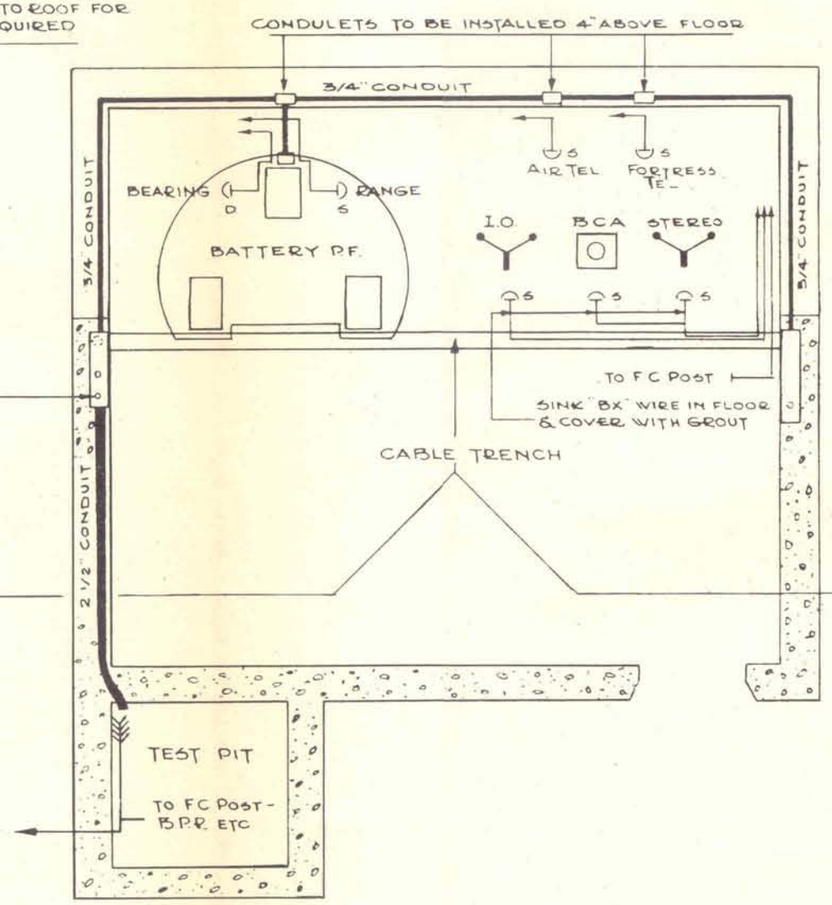
DIRECTORATE OF SIGNALS "ARMY" OTTAWA-CANADA	
TYPICAL LAYOUT - F.C. POST	
SCALE: 1/4" - 1'-0"	CHECKED
DATE: 27-JULY-4[illegible]	APPROVED
DRW'G: [illegible]	SECTION SIGS 2
TRC'G: [illegible]	DWG NO E-1-186

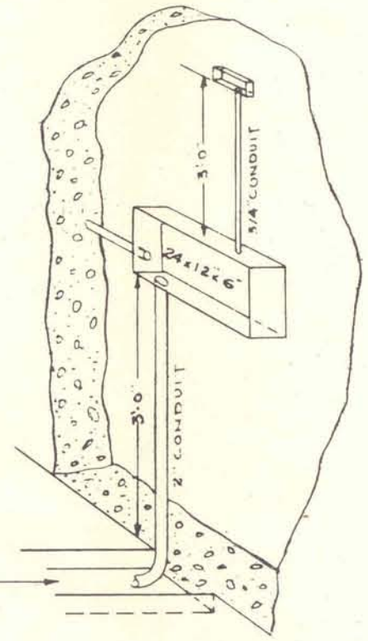


DIRECTORATE OF SIGNALS "ARMY" OTTAWA - CANADA	
TYPICAL LAYOUT FOR A BTY. PLOTTING ROOM & COMMAND POST. - 9.2" & 6" - 45° BATTERIES.	
DATE: 18 MAY 44	CHECK:
SCALE: AS SHOWN	APPROVE:
DRW'G:	SECTION: SIGS. 2
TRC'G:	DWG. NO. E-1-155



PERSPECTIVE VIEW OF WALL PANEL
WALL BROKEN AWAY FOR CLEARNESS

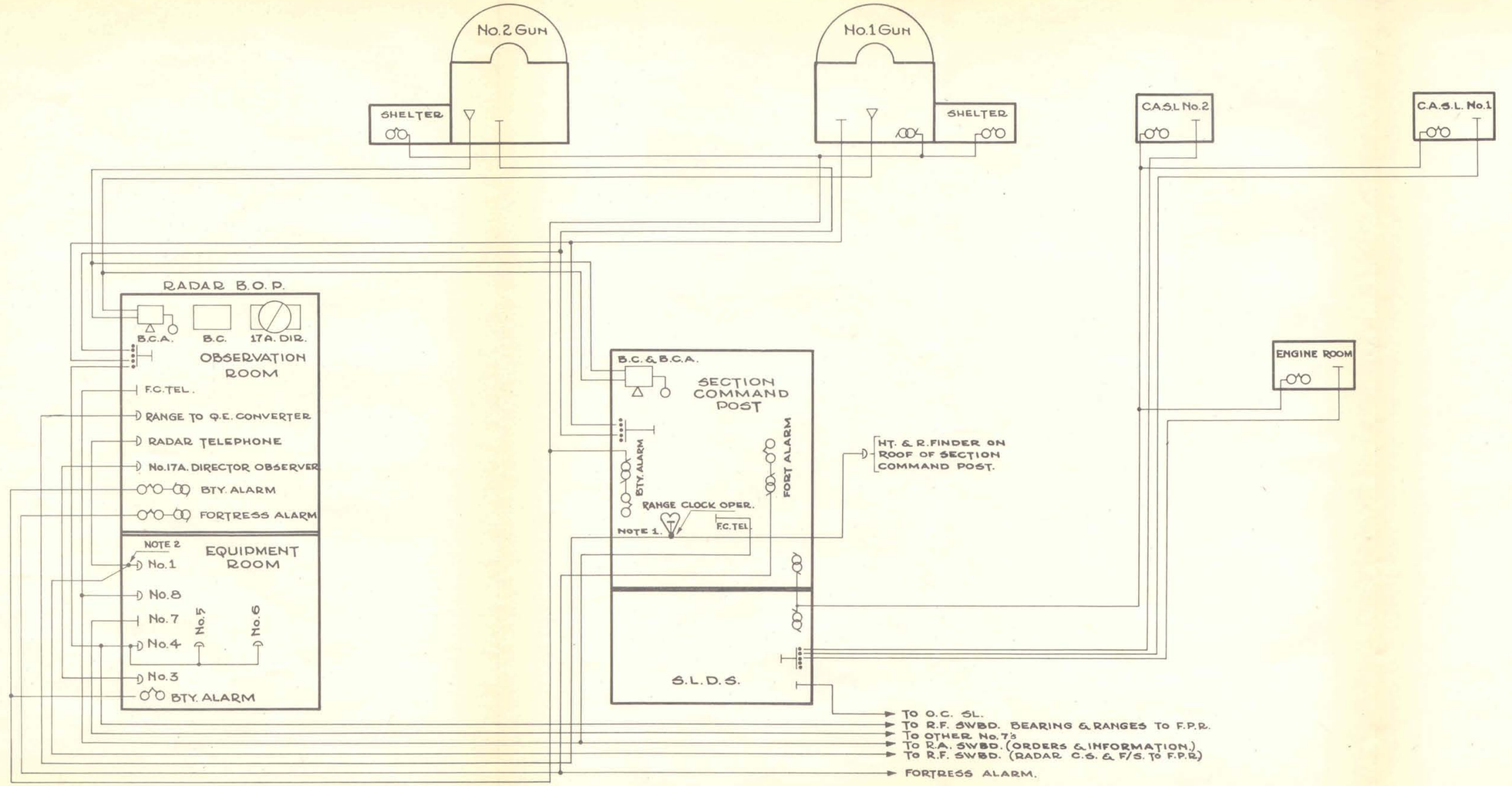




PERSPECTIVE VIEW OF WALL PANEL
WALL BROKEN AWAY FOR CLEARNESS.

DIRECTORATE OF SIGNALS "ARMY" OTTAWA - CANADA	
CONDUIT AND WIRING PLAN FOR BATTERY OBSERVATION POST	
DATE 26 JULY-44	CHECKED
SCALE	APPROVED
DRW'G ~~4445~~	SECTION: 8166 2
TRC'G ~~4446~~	DWRG. NO. E-1-156

CONFIDENTIAL



LEGEND

- Telephone - single head & breast set.
- Telephone - hand set.
- Loudspeaker (Tel. L/S. No.2 assembly) includes talk back & acknowledge button.
- Control unit. CND. Mk. I. (includes - microphone, talk back & acknowledge lights.)
- Alarm generator
- Bells - loud ringing
- Concentrator - 5 line with hand set.

NOTES

1. Range clock operator to have one earphone on Ht. & R. circuit and one earphone on range to Q.E. converter circuit. Microphone circuit to be taken through non locking key (479 C.S.) Ht. & R. circuit on non locking side - range to Q.E. converter on the other side.
2. No.1 of radar detachment to have H. & B. set (single) with No. 6017E. key so he may talk to either the radar telephonist alone or to F.P.R. alone or to both radar telephonist and F.P.R. simultaneously.

Typical Layout

DIRECTORATE OF SIGNALS ARMY
OTTAWA - CANADA

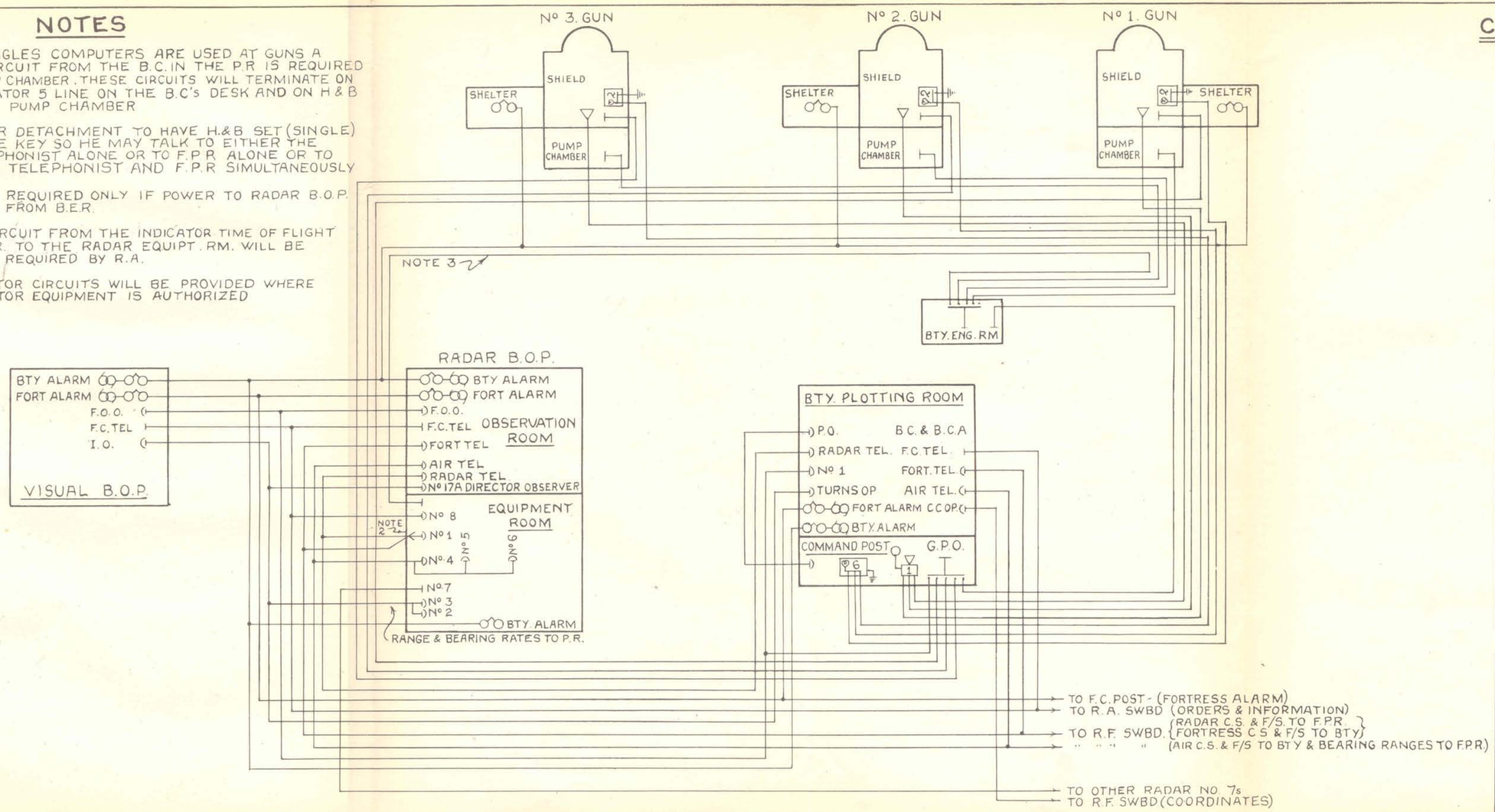
TELEPHONE & ALARM CIRCUITS FOR 4" TWIN NAVAL CL.D. BATTERY

DATE 19-JUNE-44	CHECK. AMG
SCALE NONE	APPROVE
DRW'G. AMG.	SECT. SIGS. 2
TRC'G.	NO. B-1-127

CONFIDENTIAL

NOTES

1. WHERE GUN ANGLES COMPUTERS ARE USED AT GUNS A SEPARATE CIRCUIT FROM THE B.C. IN THE P.R IS REQUIRED TO EACH PUMP CHAMBER. THESE CIRCUITS WILL TERMINATE ON A CONCENTRATOR 5 LINE ON THE B.C's DESK AND ON H & B SETS IN THE PUMP CHAMBER
2. Nº 1 OF RADAR DETACHMENT TO HAVE H.&B. SET (SINGLE) WITH Nº 6017E KEY SO HE MAY TALK TO EITHER THE RADAR TELEPHONIST ALONE OR TO F.P.R ALONE OR TO BOTH RADAR TELEPHONIST AND F.P.R SIMULTANEOUSLY
3. THIS CIRCUIT REQUIRED ONLY IF POWER TO RADAR B.O.P. IS SUPPLIED FROM B.E.R.
4. A BUZZER CIRCUIT FROM THE INDICATOR TIME OF FLIGHT IN THE B.P.R. TO THE RADAR EQUIPT. RM. WILL BE PROVIDED IF REQUIRED BY R.A.
5. SHOT INDICATOR CIRCUITS WILL BE PROVIDED WHERE SHOT INDICATOR EQUIPMENT IS AUTHORIZED



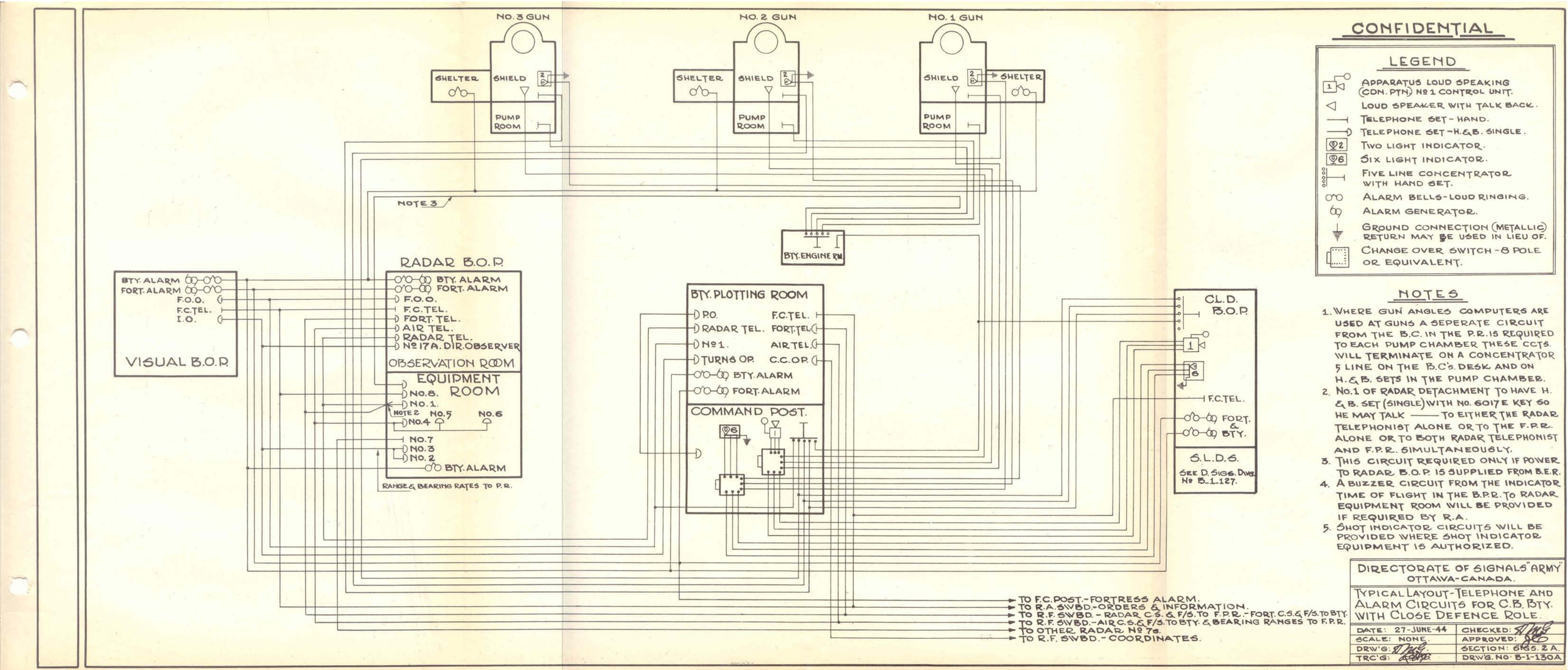
LEGEND

- APPARATUS LOUD SPEAKING (CDN PTN) Nº 1 CONTROL UNIT.
- LOUD SPEAKER WITH TALK BACK
- TEL. SET HAND
- TEL. SET HEAD & BREAST SINGLE
- TWO LIGHT INDICATOR
- SIX LIGHT INDICATOR
- FIVE LINE CONCENTRATOR WITH HAND SET
- ALARM BELLS LOUD RINGING
- ALARM GENERATOR
- GROUND CONNECTION (METALLIC) RETURN MAY BE USED IN LIEU OF

TYPICAL LAYOUT TELEPHONE & ALARM CIRCUITS FOR COUNTER BOMBARDMENT BTY WITH RADAR

DIRECTORATE of SIGNALS-ARMY-OTTAWA-CAN.			
SCALE	N.T.S.	CHECK	
DATE	21 JUN 44	APPROVE	
DWG		SECTION	SIGS 2
TRC'G		Nº	B-1-128

CONFIDENTIAL



LEGEND

- APPARATUS LOUD SPEAKING (CDN. PTN) No 1 CONTROL UNIT.
- LOUD SPEAKER WITH TALK BACK.
- TELEPHONE SET - HAND.
- TELEPHONE SET - H. & B. SINGLE.
- TWO LIGHT INDICATOR.
- SIX LIGHT INDICATOR.
- FIVE LINE CONCENTRATOR WITH HAND SET.
- ALARM BELLS - LOUD RINGING.
- ALARM GENERATOR.
- GROUND CONNECTION (METALLIC) RETURN MAY BE USED IN LIEU OF.
- CHANGE OVER SWITCH - 8 POLE OR EQUIVALENT.

NOTES

1. WHERE GUN ANGLES COMPUTERS ARE USED AT GUNS A SEPERATE CIRCUIT FROM THE B.C. IN THE P.R. IS REQUIRED TO EACH PUMP CHAMBER THESE CCTS. WILL TERMINATE ON A CONCENTRATOR 5 LINE ON THE B.C's. DESK AND ON H. & B. SETS IN THE PUMP CHAMBER.
2. No.1 OF RADAR DETACHMENT TO HAVE H. & B. SET (SINGLE) WITH No. 6017E KEY SO HE MAY TALK —— TO EITHER THE RADAR TELEPHONIST ALONE OR TO THE F.P.R. ALONE OR TO BOTH RADAR TELEPHONIST AND F.P.R. SIMULTANEOUSLY.
3. THIS CIRCUIT REQUIRED ONLY IF POWER TO RADAR B.O.P. IS SUPPLIED FROM B.E.R.
4. A BUZZER CIRCUIT FROM THE INDICATOR TIME OF FLIGHT IN THE B.P.R. TO RADAR EQUIPMENT ROOM WILL BE PROVIDED IF REQUIRED BY R.A.
5. SHOT INDICATOR CIRCUITS WILL BE PROVIDED WHERE SHOT INDICATOR EQUIPMENT IS AUTHORIZED.

DIRECTORATE OF SIGNALS "ARMY" OTTAWA-CANADA.

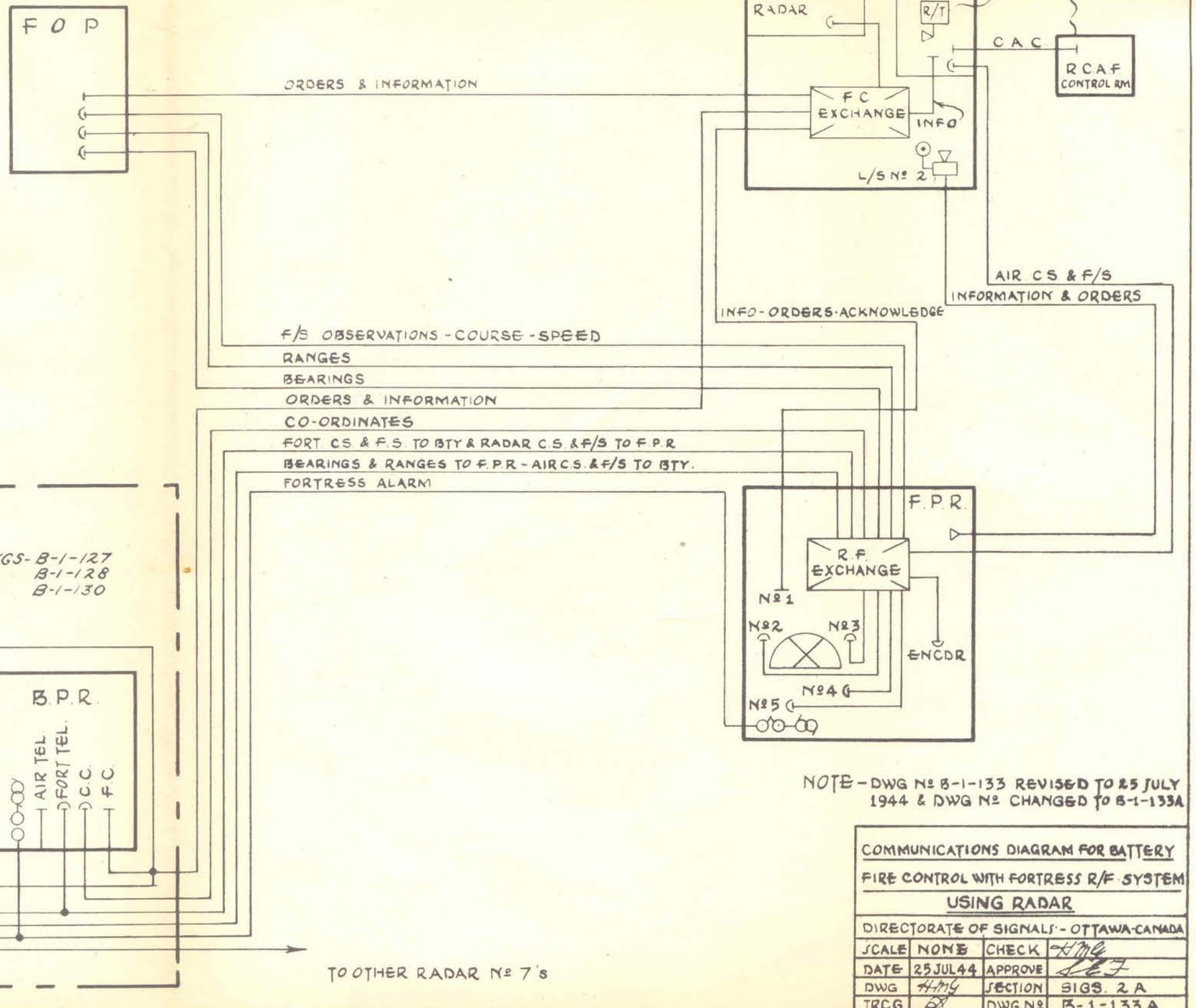
TYPICAL LAYOUT - TELEPHONE AND ALARM CIRCUITS FOR C.B. BTY. WITH CLOSE DEFENCE ROLE.

DATE: 27-JUNE-44	CHECKED:
SCALE: NONE	APPROVED:
DRW'G:	SECTION: SIGS. 2 A.
TRC'G:	DRWG. No: B-1-130A

CONFIDENTIAL

LEGEND

- TEL HAND SET
- TEL SET - HEAD & BREAST, SINGLE
- ALARM BELLS - LOUD RINGING
- ALARM GENERATOR
- LOUD SPEAKER TEL.



NOTE - DWG No B-1-133 REVISED TO 25 JULY 1944 & DWG No CHANGED TO B-1-133A

COMMUNICATIONS DIAGRAM FOR BATTERY FIRE CONTROL WITH FORTRESS R/F SYSTEM USING RADAR			
DIRECTORATE OF SIGNALS - OTTAWA-CANADA			
SCALE	NONE	CHECK	HMG
DATE	25 JUL 44	APPROVE	DEF
DWG	HMG	SECTION	SIGS. 2 A
TRCG		DWG No	B-1-133 A

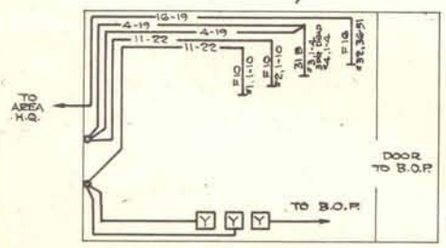
CABLE LAYOUT PLAN

SECRET

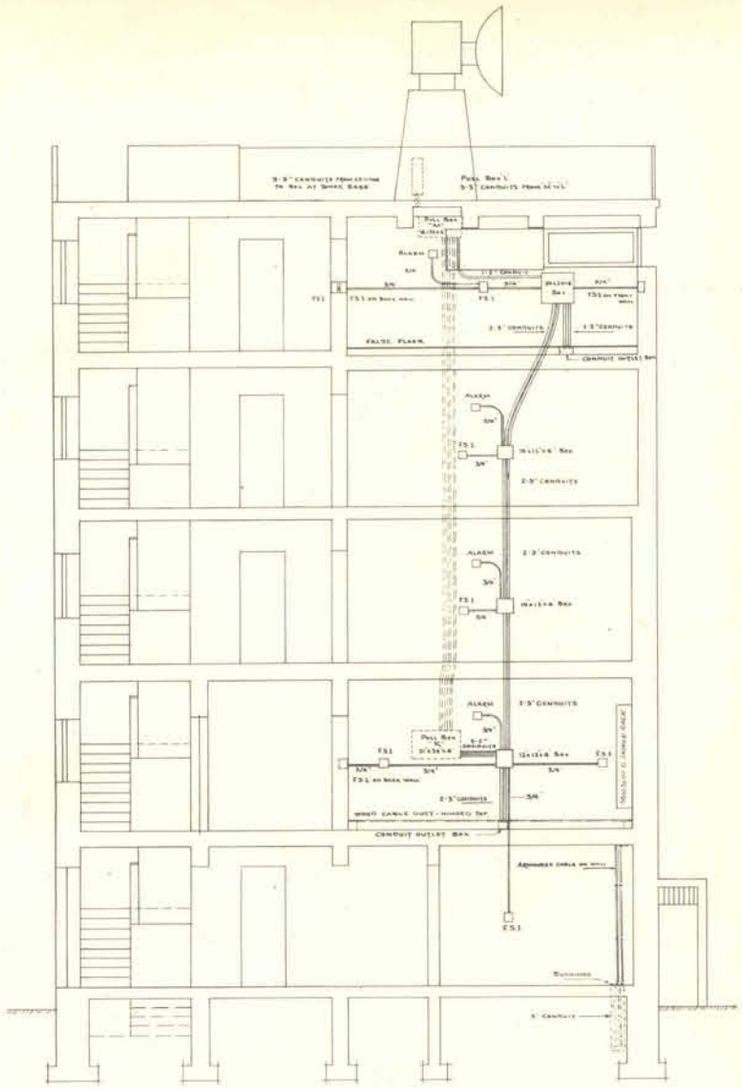
AREA
BTY OR POST
SCALE 1" = 10'

REVISIONS	DATE IN EFFECT 16 MAR 44 DR. T.B. CK. S.R.	
	DATE	DR. CK.
A		
B		
C		
D		
E		
F		
G		
H		

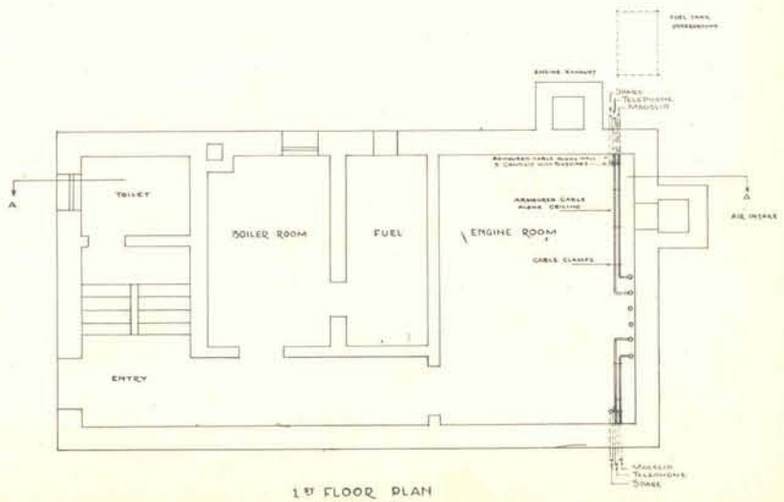
LOADING PLATFORM
ENGINE ROOM
HOIST
TEST HUT
"CABLES IN CONDUIT ENTERING TEST HUT SEE INSET FOR CABLE & TERMINAL LAYOUT
#3,1-4
3 PRS. DEAD
#5,1-4
#31-B CONN. BLK.
#5,1-4
4 PR-19 RILC-DSTA 195'
10 CORE MAGSLIP
#2,1-11
11 PR-22 PILC-DSTA
4 PR-19 RILC-DSTA 145'
10 CORE MAGSLIP 185'
#2,1-11 11 PR-22 PILC 170'
#1,1-11 11 PR-22 PILC-DSTA 230'
10 CORE MAGSLIP 233'
#4,1-4 4 PR 19 RILC-DSTA 245'
#6,1-4 4 PR. NJR 83'
Nº 2 GUN
Nº 1 GUN
1" CONDUIT
Nº 2 C.A.S.L.
Nº 1 C.A.S.L.
#5,1-4
3 PRS. DEAD
#6,1-4
#31-B CONN. BLK.
#6,1-4
3 PRS. DEAD
#4,1-4
#31-B CONN. BLK.
ATLANTIC OCEAN



DIRECTORATE OF SIGNALS "ARMY"
OTTAWA - CANADA
CABLE LAYOUT PLAN-CL.D. BTY.
DRAWING NO. B-1-141.

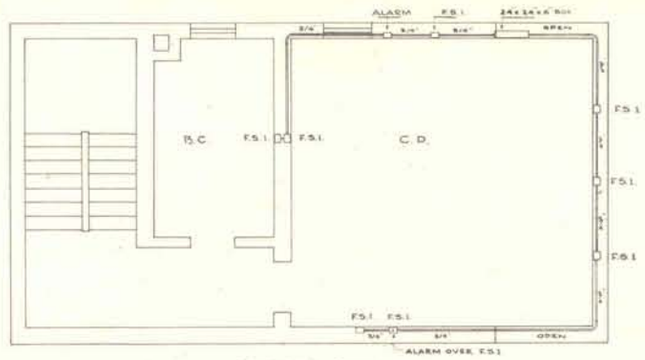


SECTION A-A

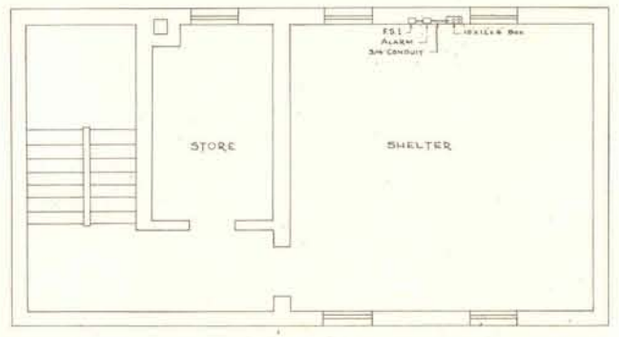


1ST FLOOR PLAN

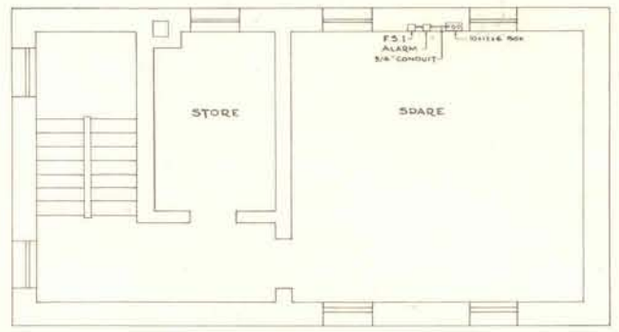
SCALE: 1/4"=1'-0"



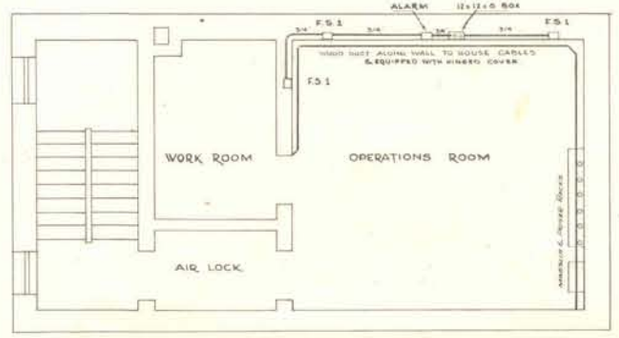
5TH FLOOR PLAN



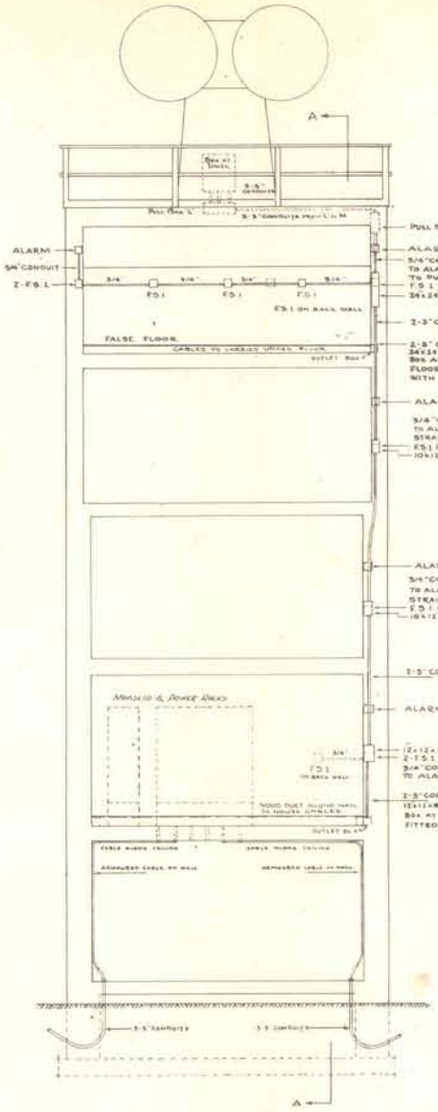
4TH FLOOR PLAN



3RD FLOOR PLAN



2ND FLOOR PLAN



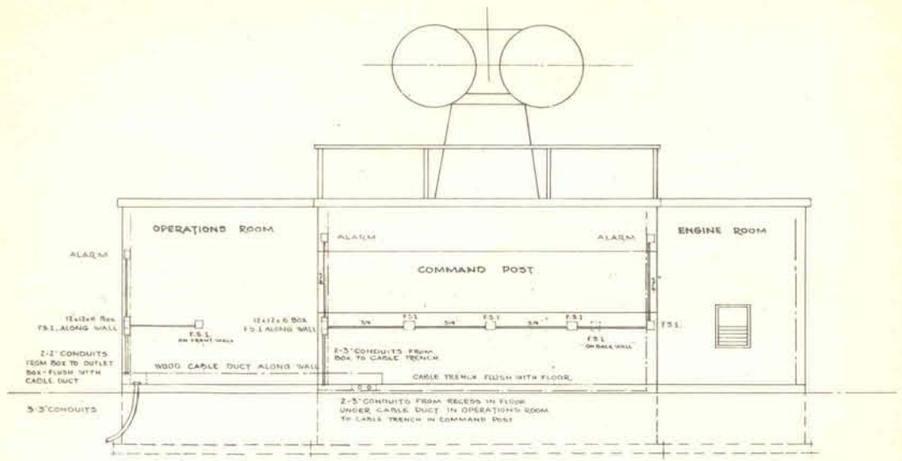
FRONT ELEVATION

NOTE

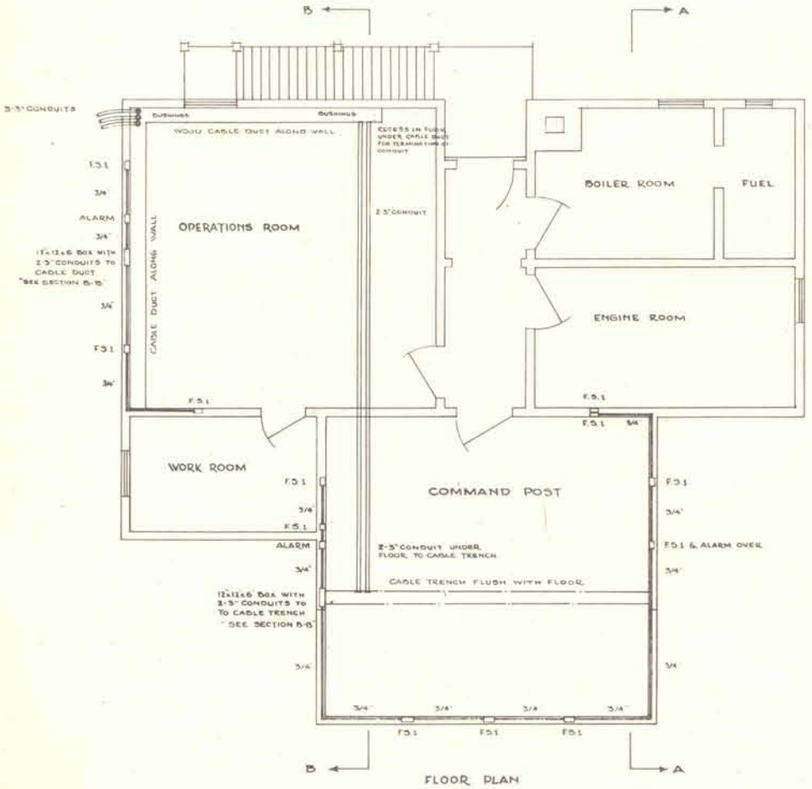
THIS CONDUIT LAYOUT APPLIES PARTICULARLY WHERE OPERATIONS ROOM IS SITUATED ON SECOND FLOOR OF RADAR B.O.P.

SECRET

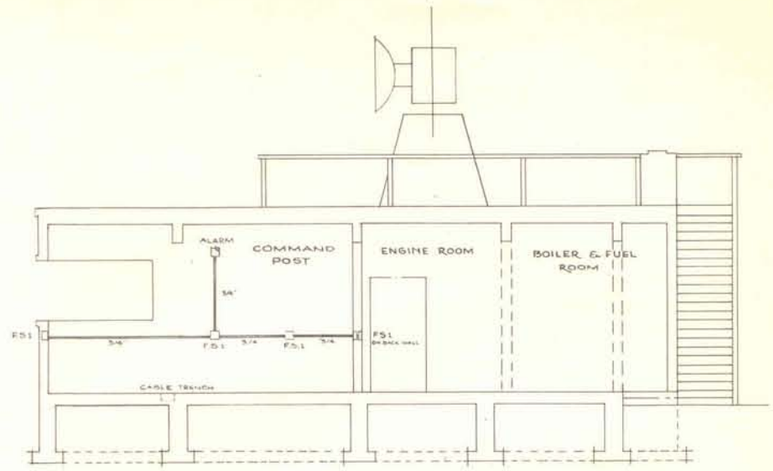
DIRECTORATE OF SIGNALS "ARMY" OTTAWA ~ CANADA	
TYPICAL CONDUIT LAYOUT RADAR B.O.P.	
DATE 7-MAR.-44	CHECKED J.E. Gutsell Maj
SCALE: 1/4"=1'-0"	APPROVED
DRAWING [illegible]	REVISIONS
TRACING [illegible]	DWG.No B-1-85



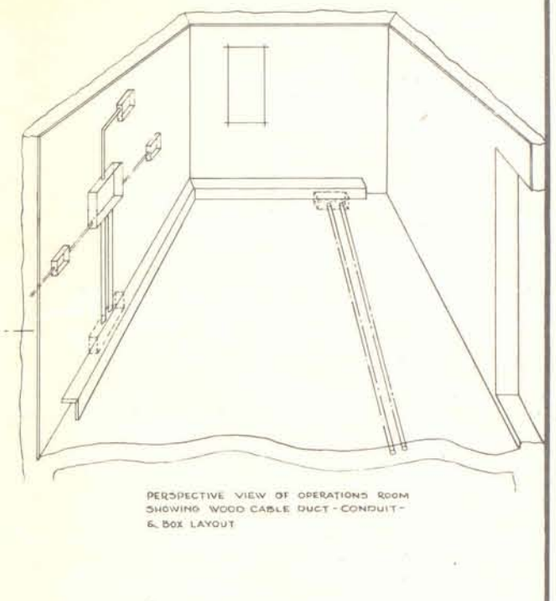
FRONT ELEVATION



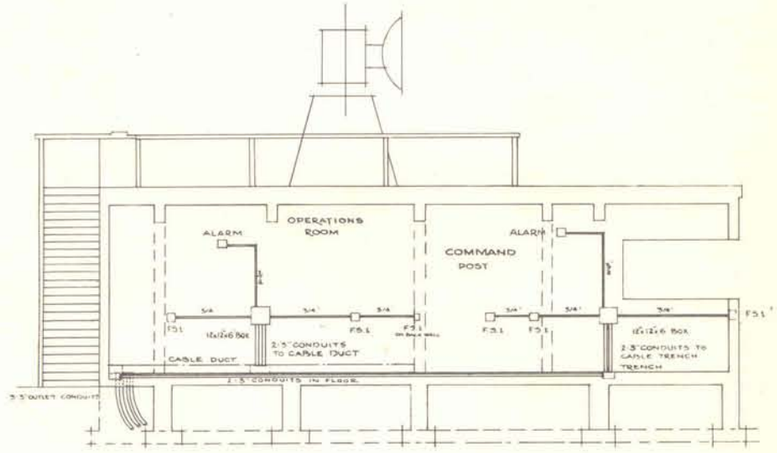
FLOOR PLAN



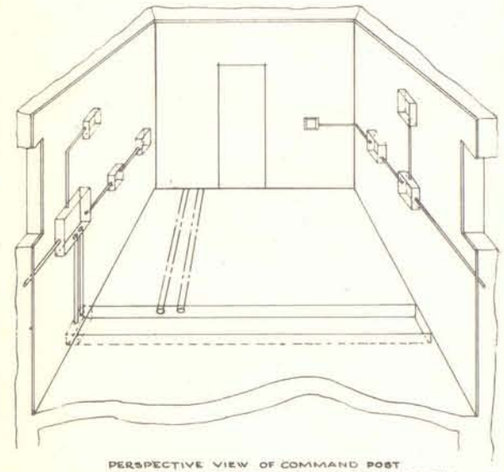
SECTION A-A



PERSPECTIVE VIEW OF OPERATIONS ROOM SHOWING WOOD CABLE DUCT - CONDUIT - & BOX LAYOUT



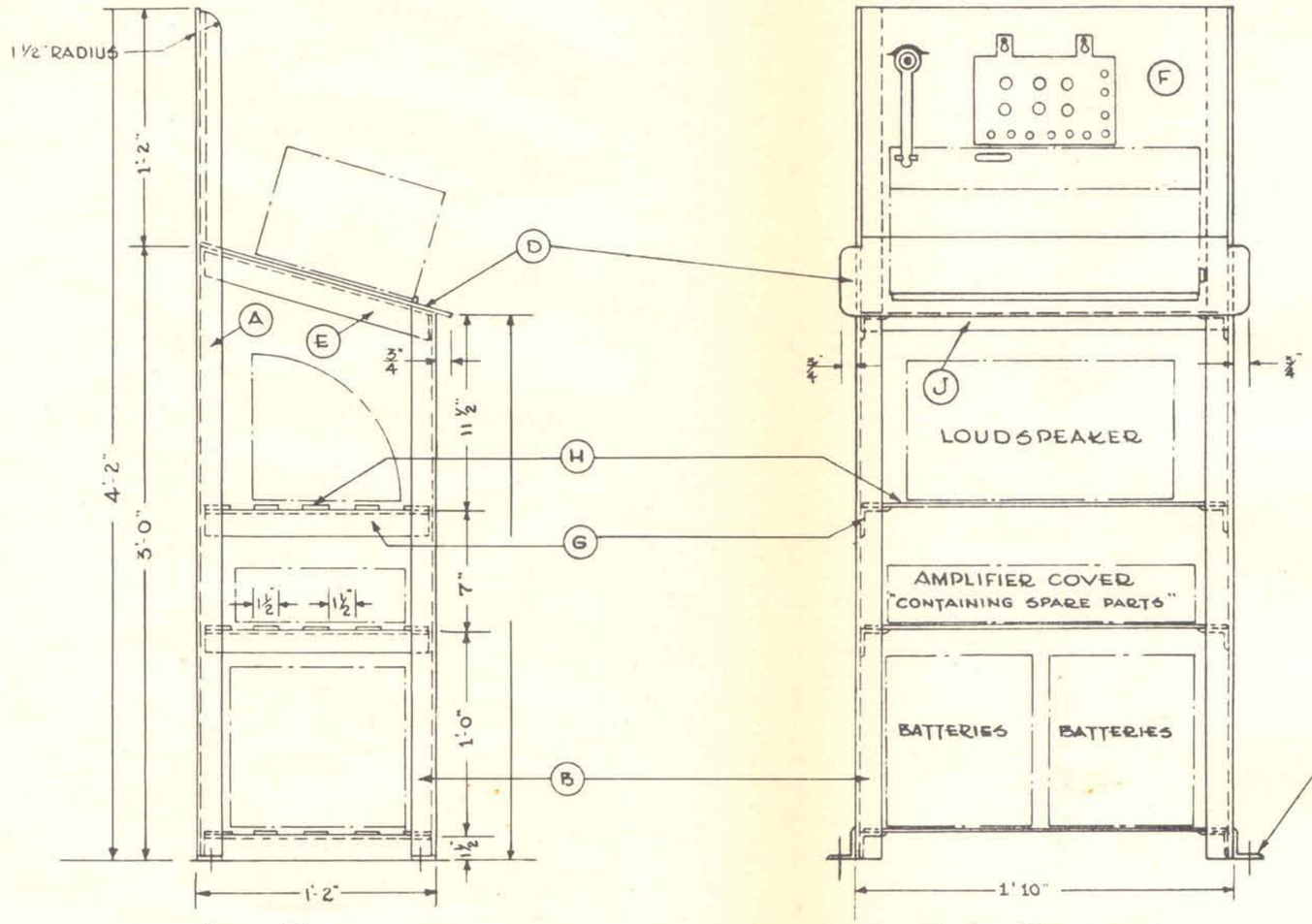
SECTION 'B-B



PERSPECTIVE VIEW OF COMMAND POST SHOWING CABLE TRENCH - CONDUIT - & BOX LAYOUT.

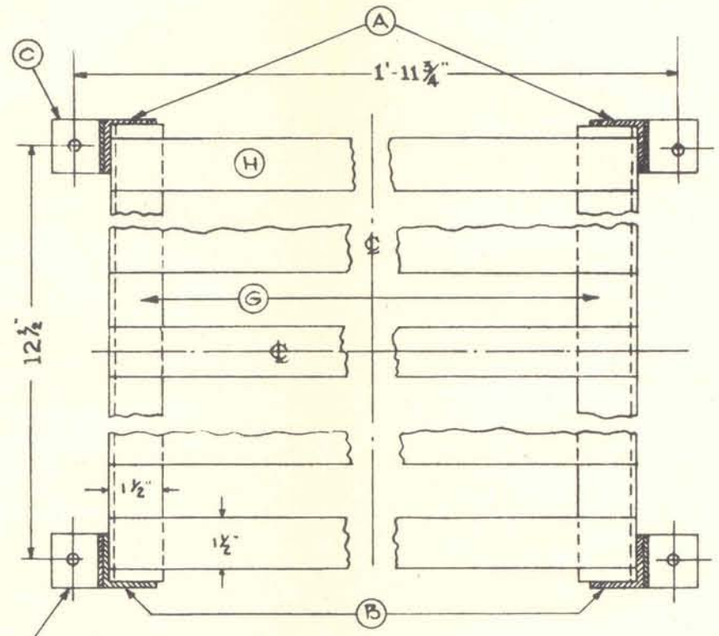
SECRET

DIRECTORATE OF SIGNALS "ARMY" OTTAWA - CANADA	
CONDUIT LAYOUT - RADAR B.O.P. SPECIAL ONE-STORY - WOOD CONST.	
DATE: 22-MAR-44	CHECKED:
SCALE: 1/4" = 1'-0"	APPROVED:
DRAWING:	REVISIONS:
TRACING:	DRAWING NO. E-1-125.



SIDE ELEVATION

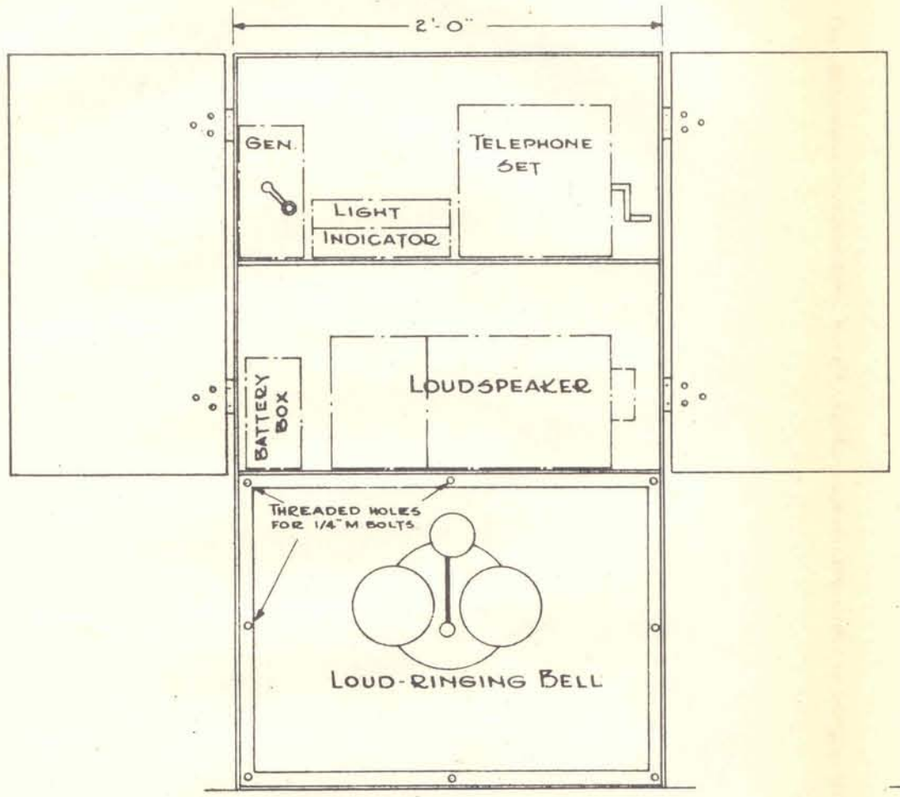
FRONT ELEVATION



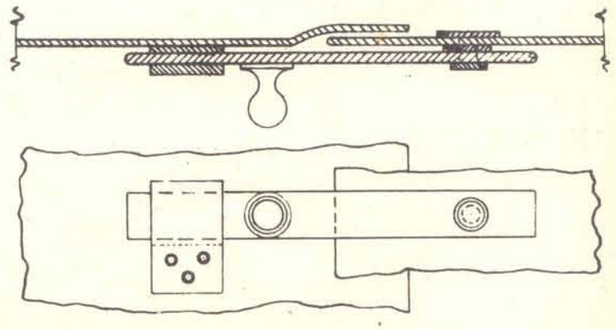
SECTION THRU RACK AT BASE

NOTE: ALL JOINTS TO BE WELDED.

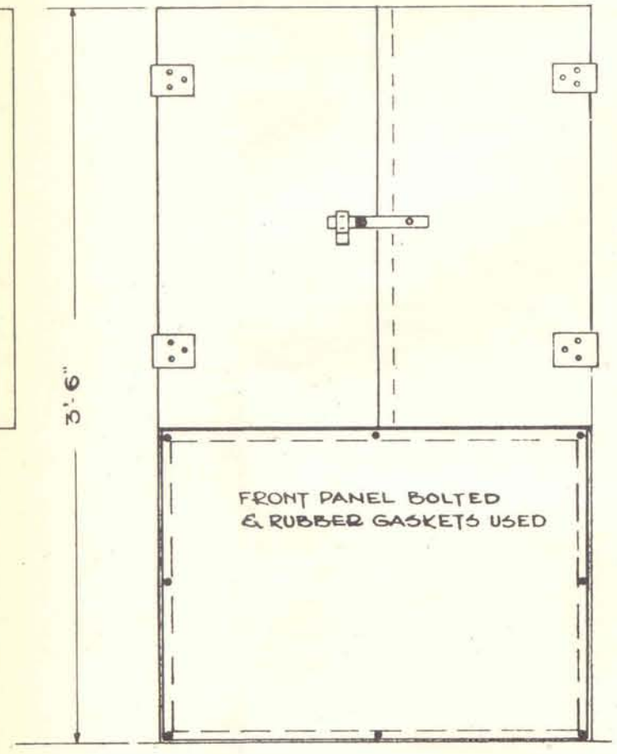
DIRECTORATE OF SIGNALS "ARMY" OTTAWA-CANADA.	
DETAILS OF STEEL RACK FOR AMPLIFIER EQUIPMENT.	
DATE: 24-JULY-44	CHECKED:
SCALE: 1½" = 1'-0"	APPROVED:
DRW'G:	SECTION: 3165.2.
TRC'G:	DWG. NO. E-1-149



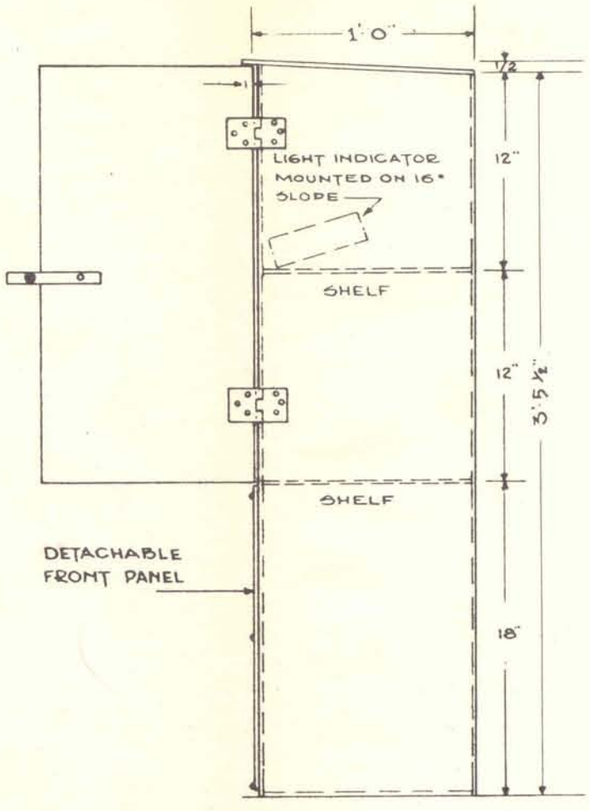
FRONT ELEVATION
"OPEN"



DETAILS OF DOOR FASTENING
"NOT TO SCALE"



FRONT ELEVATION
"CLOSED"



SIDE ELEVATION

NOTE
ALL DIMENSIONS SHOWN ARE INSIDE MEASUREMENTS.
#14 GA PLATE USED.

DIRECTORATE OF SIGNALS ARMY OTTAWA-CANADA	
DETAILS OF STEEL CABINET FOR AMPLIFIER EQUIPMENT	
DATE - 25-JULY-44	CHECKED:
SCALE - 1 1/2" = 1'-0"	APPROVED:
DRW'G -	SECTION - SIGS 2
TRC'G -	DRW'G NO. E-1-153

ANTI-AIRCRAFT

A.A.	Anti-Aircraft.
A.A.D.	Anti-Aircraft Defence
A.A.D.C.	Anti-Aircraft Defence Commander
A.A.S.L.	Anti-Aircraft Search Light
A.A.O.R.	Anti-Aircraft Operations Room.
A.F.H.Q.	Air Force Head Quarters
A.D.	Air Defence
C.H.L.	Chain Home Low (Radar)
C.P.	Command Post
C.D.No.1	Coast Defence Radar
G.C.I.	Ground Control Interception (Radar)
G.D.A.	Gun Defended Area
G.L.	Gun Laying (Radar)
G.D.O.	Gun Duty Officer
G.D.O.A.	Gun Duty Officer's Assistant
G.O.R.	Gun Operations Room
G.P.O.	Gun Positions Officer
G.P.O.A.	Gun Positions Officer's Assistant
H.A.A.	Heavy Anti-Aircraft
I.F.C.	Instructor on Fire Control
I.F.F.	Identification Friend or Foe
I.G.	Instructor in Gunnery
I.O.	Intellegence Officer
L.A.D.	Light Aid Detachment (Repairs) x
L.A.A.	Light Anti-Aircraft
L. of C.	Lines of Communication
L.C.M.	Landing Craft (Mechanized)
L.G.	Landing Ground
L/T	Line Telephony
O.F.C.	Operators Fire Control
O.P.	Observation Post
P.O.	Plotting Officer
P.O.A.	Plotting Officers Assistant
P.R.	Plotting Room
PL.	Plotter
P.F.	Position Finder
Q.E.	Quadrant Elevation
R.C.E.M.E.	Royal Canadian Electrical & Mechanical Engineers (maintenance (junction of (Ordnance.
R/T	Radio Telephony
S.L.C.	Search Light Control (Radar)
T.C.O.	Tactical Control Officer
T.C.O.A.	Tactical Control Officer's Assistant
V.A.	Vulnerable Area
V.P.	Vulnerable Point
W/T	Wireless Telephony
Z.P.I.	Zone Position Indicator

AIRCRAFT

A.O.C.	Air Officer Commanding

NAVY

C.W.P.	Coast Watching Post
C.X.O.	Chief Examination Officer
M.L.	Motor Launch
M.W.S.S.	Minor War Signal Station

NAVY -(Cont'd)

N.O.i/c	Naval Officer in Charge
P.W.S.S.	Port War Signal Station
S.M.O.	Selected Military Officer
W.S.S.	War Signal Station
X.D.O.	Extended Defence Officer

SEARCHLIGHTS

C.A.S.L.	Coast Artillery Searchlights
O.C.S.L.	Officer in Charge Searchlights
S.L.Comdr.	Searchlight Commander
S.L.D.S.	Searchlight Directing Station
S.L.E.	Searchlight Emplacement
S.L.E.R.	Searchlight Engine Room

FORTRESS

A.D.P.F.	Azimuth D.P.F.
A.L.O.	Advanced Look-out
A/M.T.B.	Anti-Motor Torpedo Boat
B. and S.	Barr and Stroud Range Finder
B.C.	Battery Commander
B.C.A.	Battery Commander's Assistant
B.O.P.	Battery Observation Post (visual, Radar, or Combined Visual and Radar)
Bty.	Battery
C.B.	Counter Bombardment
C.C.	Co-ordinate Converter
C.D.D.	Coast Defence Director
Cl.D.	Close Defence
C.P.	Command Post
DECDR	Decoder, Fall of Shot
D.P.F.	Depression Position Finder
D.R.F.	Depression Range Finder
ENCDR.	Encoder, Fall of Shot
ENCDR.	Encoder, operator
Ex. Bty	Examination Battery
F.C.	Fire Commander
F.C.P.F.	Fire Commander's P.F.
F.of S. or S/F.	Fall of Shot
F.O.P.(H.S.	Fortress Observation Post (High-Sited)
F.O.P.(L.S.)	Fortress Observation Post (Low-Sited)
F.O.O.	Forward Observing Officer
F.P.R.	Fortress Plotting Room
F/S	Fall of Shot Observer
F.S.S.	Fixed Signal Services
G.P.O.	Gun Position Officer
INCL.	Inclinoscope
I.O.	Inclination Officer
P.A.D.	Passive Air Defence
Pl.O.	Plotting Officer
STEREO.	Stereoscopic Telescope
T.	Telephonist
T.F.D.	Table, Fire Detection
X.O.	Exchange Operator

Directorate of Signals "Army" Ottawa, Canada

ABBREVIATIONS - FIXED SIGNAL SERVICES

Date---4-5-44.

SYMBOLS & ABBREVIATIONS (CONSTRUCTION)

Poles, Guys, Anchors and Pole Braces

O	R.C. Sigs Pole
X	Power Co. Pole
T	Telephone Co. Pole
C	Telegraph Co. Pole
R	Railroad Co. Pole
G	Government Pole
	Anchor and Guy
	Pole to Pole Guy (R.C. Sigs)
TR	Guy to Tree (R.C. Sigs)
BLDG	Guy to Building (R.C. Sigs)
PB	Push Brace
OGB	(R.C. Sigs) Pole with Ground Brace

CABLE

Non-Quadded Cable

#8 1-26 P.I.L.C / 26-19 / 1560' — Paper insulated, lead covered cable, 26 pr. 19 ga. 1560' Long, Cable #8, Pair Count 1 to 26

BURIED #8 1-16 DSTA / 16-19 / 2600' — Double steel tape armoured buried cable, 16 pr. 19 ga., 2600' Long, Cable #8, Pair Count 1 to 16

Quadded Cables

S/M 2 QDS 16 GA 1-4 7 PRS 19 GA 5-11 #2 11 PRS D.W.A. / 2960' — Double wire armoured submarine cable, 11 prs. (2 quads. 16 ga. pair count 1 to 4 and 7 pr. 19 ga. pair count 5 to 11, Cable #2)

—51-22→←26-19— Change in cable with respect to size, gauge or both, at junction between aerial and underground or submarine cable without cable terminal. The abbreviations, Aer., S/M or U.G. are to be placed before the respective cable sizes, to be accompanied by cable numbers and details as to complements, gauges and pair counts.

——26-22——→ When used at end of cable symbol denotes cable continues along route. When cable is continued on some other plan, a reference to the other plan number should be made at point of arrow.

#10 1-26 JP / 26-19 / 2000' — Jute Protected PILC Cable 26 pair, 19 gauge 2,000' long cable #10 pair count 1 to 26.

#2 19C-17 JP / 1000' — Jute Protected Impregnated PILC Magsleys cable. 19 core, 17 gauge, 1000 ft. long. Cable No. 2.

#3 22C-16 DSTA / 1000' — Double Steel Tape Armoured, Impregnated PILC, Magsleys Cable. 22 core, 16 gauge, 1000' long. Cable No. 3.

Ground

Insulating Joint

—26-19—●—26-19— Splice where no change in cable occurs.

CABLE TERMINALS

F 16 / 1-16 — Unprotected outside terminal, type F, Capacity 16 prs. Pair count 1 to 16.

GA 52 / 1-52 — Unprotected inside terminal, type GA, Capacity 52 prs. Pair count 1 to 52.

Protected with fuses.

Protected without fuses.

UG 2, 1-51 BD 102 2-1-51 3-1-51 3, 1-51 AER — Cross Connecting terminal without fuses. Type BD, Cap. 102 prs. Terminating Cable #2 (UG) prs. 1-51 and Cable #3 (Aer) p prs. 1-51.

Cross Connecting Terminal with Fuses.

S
Straight Connecting with fuse.

F16 / 1-16 — 5 — Cable terminal Type F, Cap. 16 prs. Pr. Count 1-16, with provision for the protection of 5 prs., in an auxiliary box outside of terminal (E.G. BOX 83A)

ABBREVIATIONS

Aer.	Aerial Cable.
D.S.T.A.	Double Steel tape armoured.
D.W.A.	Double wire armoured.
Ga.	Gauge of Cable Conductors.
P.I.L.C.	Paper insulated, Lead Covered.
Pr.	Pair, used with indication of non-quadded cable complement.
Qd.	Quad, used with indication of Quadded cable complement.
R.I.L.C.	Rubber insulated, Lead covered.
S/M.	Submarine.
S.T.A.	Single Tape Armoured.
S.W.A.	Single Wire Armoured.
TI	Textile Insulated.
U.G.	Underground.
J.P.	Jute Protected.

FIXED SIGNAL SERVICES
SYMBOLS AND ABBREVIATIONS FOR
POLES GUYS CABLE & TERMINALS

DIRECTORATE OF SIGNALS (ARMY)
OTTAWA CANADA

4 MAY 44 File No. E-1-164

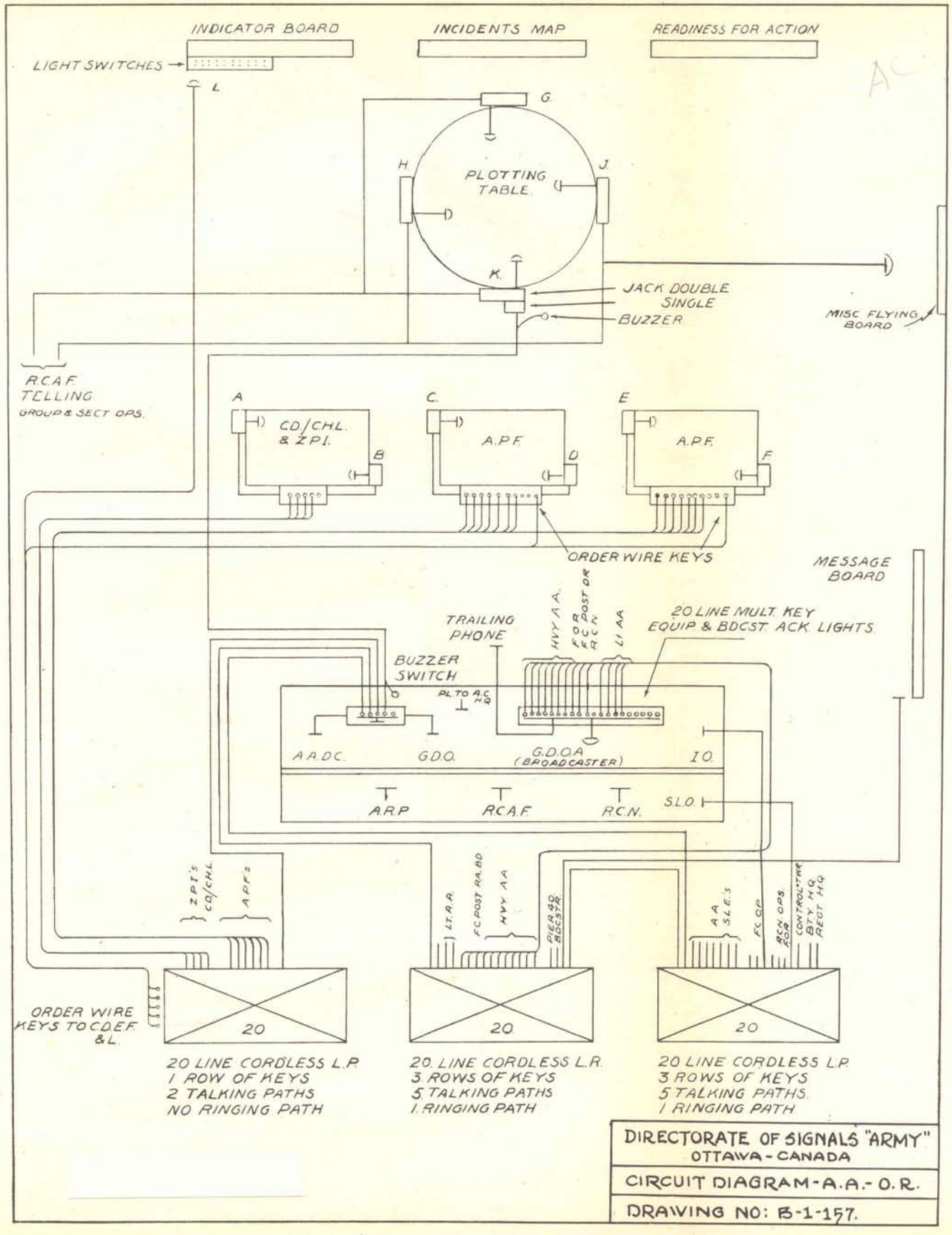
APPENDIX "C"

1. Telephone Circuits to A.A.O.R.
2. Circuit Diagram for A.A.O.R.
3. A.A. Circuit Diagram.
4. Equipment and Wiring Layout for H.A.A.—Command Post and Plotting Room with Satellite P.R.
5. Communication Diagram H.A.A. Site, Plotting Room and Command Post.

NOTE: R/T IS NOT SHOWN BUT SHOULD BE PROVIDED WHERE POSSIBLE AS ALTERNATIVE TO TELEPHONE FOR EMERGENCY USE.

C.H.L.
G.C.I.
A.D.C.
AERODROMES
R.C.A.F GROUP OPERATIONS
R.C.A.F SECTOR OPERATIONS
EARLY WARNING PLOTS
LIAISON - INTELLIGENCE
A.A.L.O.
R.C.N.
WARNINGS - LIAISON & FIRE ORDERS
INTELLIGENCE
FORTRESS
WARNINGS - INTELLIGENCE
LAND BATTLE & GROUND TARGETS
C.D. - R.D.F.
C.D.
FIRE COMMANDER
WARNINGS - C.D. TARGETS ENGAGED BY A.A.
NEIGHBORING A.A.O.R.'s
LIAISON - INTELLIGENCE
POLICE
FIRE SERVICE
A.R.P.
WARNINGS - LOCATION OF FIRES
TELEPHONE NETWORK
SIGNAL CENTRE
LINE CONNECTING TO GENERAL TEL. NETWORK
TELEPRINTER NETWORK
SIGNAL CENTRE
LINE CONNECTING TO TELEPRINTER NETWORK
A.A. OBSERVATION POST
ANY USEFUL INFORMATION
A.A.O.R.
L.A.A. H.Q
L.A.A H.Q
WARNINGS - ENGAGEMENT REPORTS
WARNINGS - ENGAGEMENT REPORTS
UP Z.P.I. PLOTS
UP P.F. PLOTS & REPORTS
DOWN BROADCAST - WARNINGS & ORDERS
H.A.A. SITE
P.F.
Z.P.I.
UP P.F PLOTS - REPORTS
DOWN BROADCAST
LATERAL CIRCUIT
LATERAL CIRCUIT
DOWN BROADCAST & WARNINGS - ORDERS
UP P.F. PLOTS - REPORTS
WARNINGS - ORDERS
H.A.A SITE
H.A.A. SITE
LATERAL CIRCUIT
P.F.
Z.P.I.
P.F
Z.P.I.
LIAISON & CO-ORDINATION
A.A. DEFNCES

DIRECTORATE OF SIGNALS "ARMY" OTTAWA - CANADA	
TYPICAL ARRANGEMENT OF TELEPHONE CCTS TO AN A.A. O.R.	
DATE 21 JULY 44	CHECKED:
SCALE NONE	APPROVED:
DWG:	SECTION SIGS. 2
TR'CG:	DWG Nº E-1-24


INDICATOR BOARD
INCIDENTS MAP
READINESS FOR ACTION
LIGHT SWITCHES
L
G
H
PLOTTING TABLE
J
K
JACK DOUBLE
SINGLE
BUZZER
MISC FLYING BOARD
R.C.A.F. TELLING
GROUP & SECT OPS.
A
CO/CHL & ZPI.
B
C
A.P.F.
D
E
A.P.F.
F
ORDER WIRE KEYS
MESSAGE BOARD
TRAILING PHONE
HVY A.A.
FC POST OR RCN
LT AA
20 LINE MULT. KEY EQUIP & BDCST. ACK. LIGHTS
BUZZER SWITCH
PL TO A.C. HQ
A.A.D.C.
G.D.O.
G.D.O.A (BROADCASTER)
I.O.
A.R.P
R.C.A.F.
R.C.N.
S.L.O.
ZPI'S CO/CHL
APF's
LT A.A.
FC POST RA BD
HVY AA
PIER 40 BDCSTR
AA SLE'S
FC OP
RCN OPS. FOR CONTROLLING BTY HQ REGT HQ
ORDER WIRE KEYS TO C.D.E.F. & L.
20
20
20
20 LINE CORDLESS L.P.
1 ROW OF KEYS
2 TALKING PATHS
NO RINGING PATH
20 LINE CORDLESS L.R.
3 ROWS OF KEYS
5 TALKING PATHS
1 RINGING PATH
20 LINE CORDLESS L.P.
3 ROWS OF KEYS
5 TALKING PATHS
1 RINGING PATH
DIRECTORATE OF SIGNALS "ARMY"
OTTAWA - CANADA
CIRCUIT DIAGRAM - A.A. - O.R.
DRAWING NO: B-1-157.

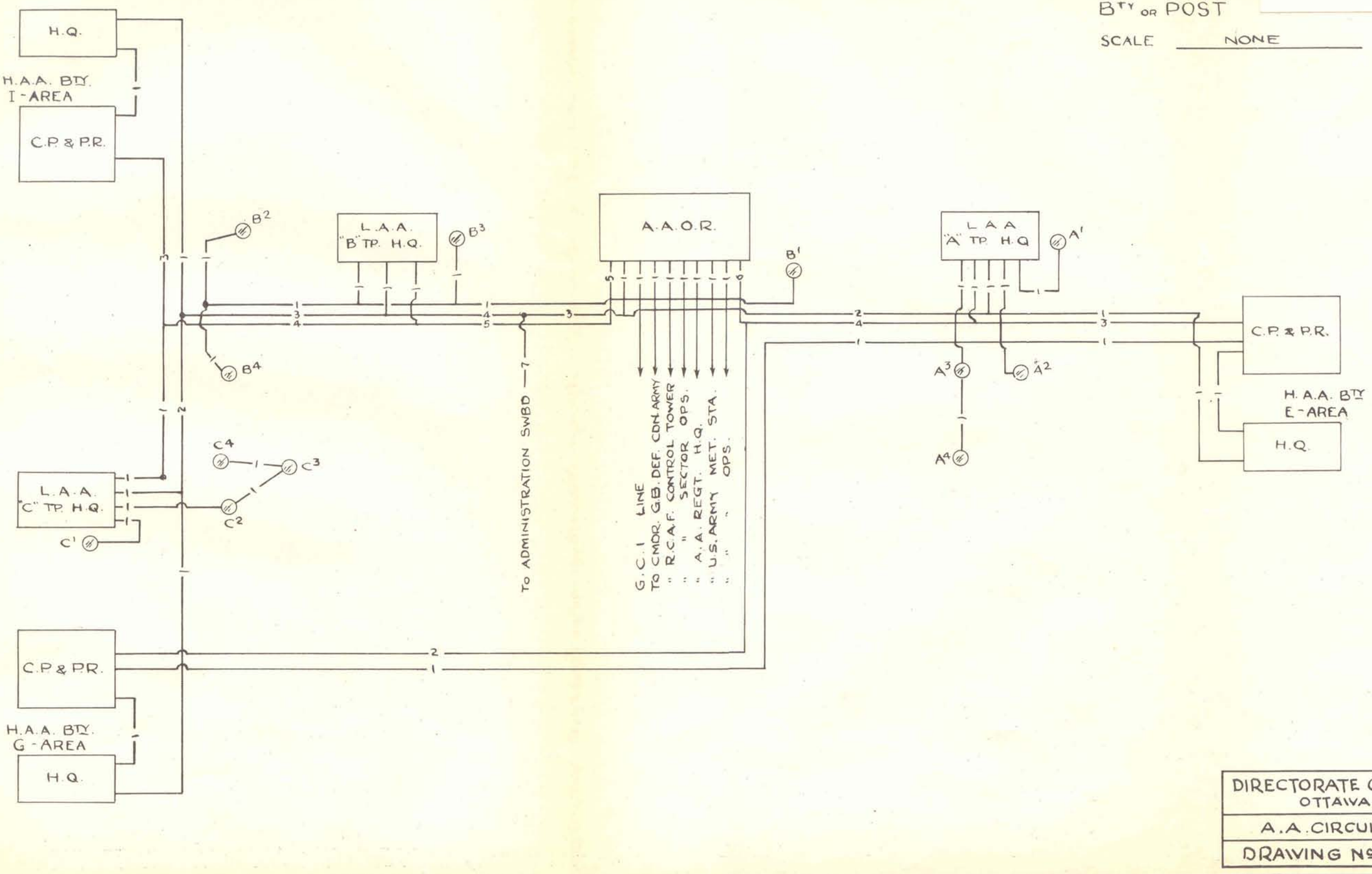
A.A. CIRCUIT DIAGRAM

AREA

BTY OR POST

SCALE NONE

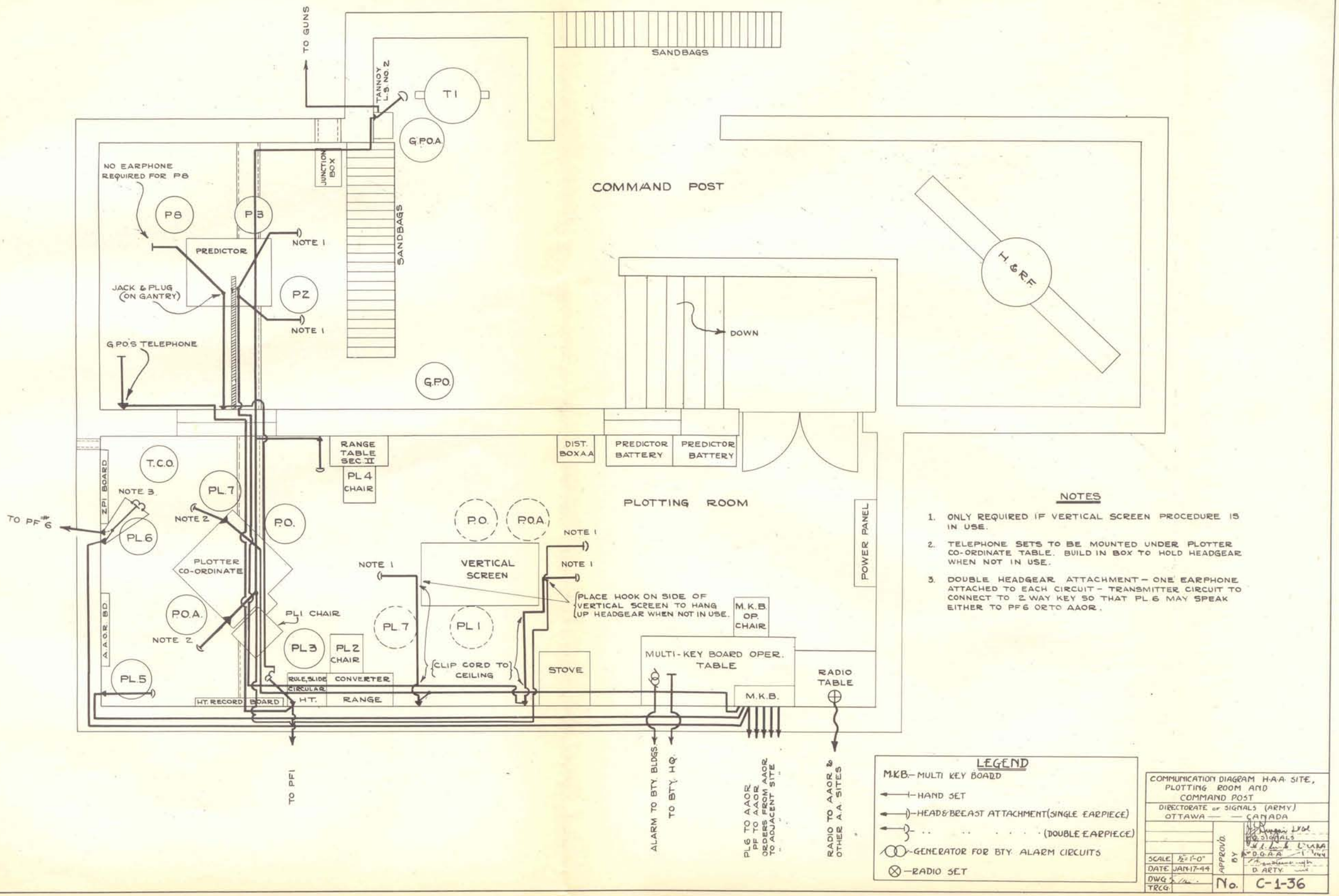
REVISIONS	DATE IN EFFECT 29 MAR 44		
	DR. S.S. CK. J.K.		
	DATE	DR.	CK.
A	5-APR-44	aj	JK
B			
C			
D			
E			



DIRECTORATE OF SIGNALS "ARMY"
OTTAWA - CANADA

A.A. CIRCUIT DIAGRAM

DRAWING Nº B-1-145



NOTES

1. ONLY REQUIRED IF VERTICAL SCREEN PROCEDURE IS IN USE.
2. TELEPHONE SETS TO BE MOUNTED UNDER PLOTTER CO-ORDINATE TABLE. BUILD IN BOX TO HOLD HEADGEAR WHEN NOT IN USE.
3. DOUBLE HEADGEAR ATTACHMENT – ONE EARPHONE ATTACHED TO EACH CIRCUIT – TRANSMITTER CIRCUIT TO CONNECT TO 2 WAY KEY SO THAT PL 6 MAY SPEAK EITHER TO PF 6 OR TO AAOR.

LEGEND

M.K.B.– MULTI KEY BOARD

—|– HAND SET

—)– HEAD & BREAST ATTACHMENT (SINGLE EARPIECE)

—)– . . . . . (DOUBLE EARPIECE)

⊙⊙ – GENERATOR FOR BTY. ALARM CIRCUITS

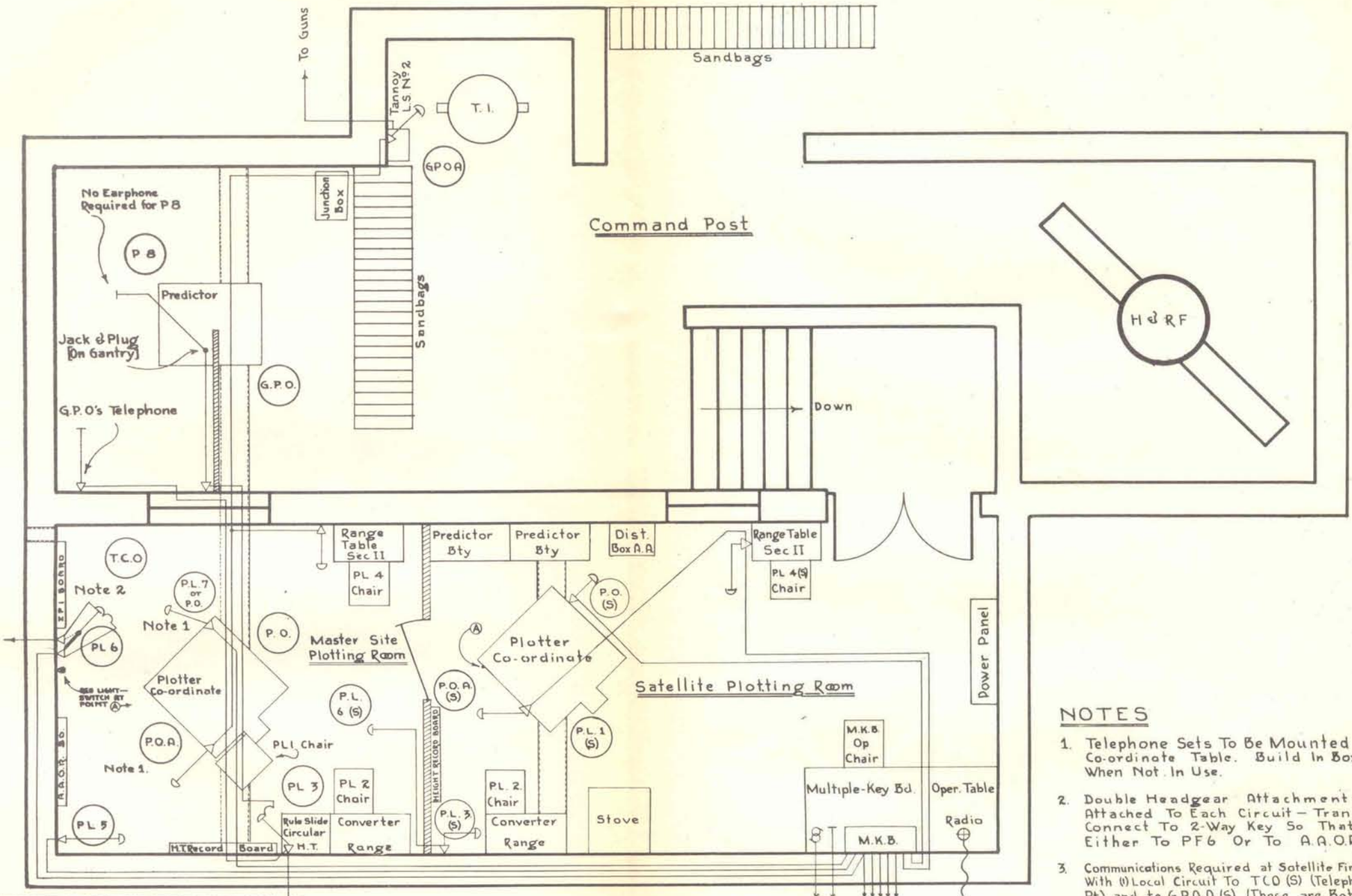
⊗ – RADIO SET

COMMUNICATION DIAGRAM H.A.A. SITE, PLOTTING ROOM AND COMMAND POST

DIRECTORATE OF SIGNALS (ARMY)
OTTAWA — — CANADA

		APPROV'D. BY	D. SIGNALS D.O.A.A. D. ARTY.
SCALE	1/2" = 1'-0"		
DATE	JAN-17-44		
DWG. & TRCG.		No.	C-1-36

CONFIDENTIAL



LEGEND

M.K.B.	Multi-Key Board
—⊣	Hand Set
—D	Head & Breast Attachment (Single Earpiece)
—B	" " " (Double ")
∞	Generator For Bty Alarm Circuits
⊕	Radio Set

NOTES

1. Telephone Sets To Be Mounted Under Plotter Co-ordinate Table. Build In Box To Hold Head gear When Not In Use.
2. Double Headgear Attachment — One Earphone Attached To Each Circuit — Transmitter Circuit To Connect To 2-Way Key So That P.L. 6 May Speak Either To PF 6 Or To A.A.O.R.
3. Communications Required at Satellite Firing Point Are: 5 Line Concentrator With (1) Local Circuit To T.C.O (S) (Telephone Set Inside P.R. at Firing Pt.) and to G.P.O.A.(S) (These are Both on the Same Circuit) (2) Local Circuit to P.L. 7.(S) Located Inside P.R. (3) Local to P.L. 5 (S) Located Inside P.R.

Communication Diagram
H.A.A. Site, Master Site
P.R. & C.P. With Satellite P.R.

DIRECTORATE of SIGNALS Army OTTAWA CANADA

SCALE	1/2"=1'-0"	CHECK	
DATE	4 MAY 44	APPROVE	
DWG		SECT	SIGS 2A
TRCG	78	NO	B-1-132

APPENDIX "D"

1. Rented or Leased F.S.S. Policy of Provision.
2. Traffic Study.
3. Busy Report.
4. Standard Operating Tricks.
5. Telephone Application Forms.
6. Report of Telephone Equipment.
7. List of Telephone Users.
8. P.B.X. Record.
9. Local Record.
10. Leased Circuit—Tie Trunk or Private Line Record.
11. Individual or Two Party Line Record.
12. Record of Long Distance Call, Forms 411 and 412.
13. Individual P.B.X. Summary.

RENTED OR LEASED FIXED SIGNAL SERVICES POLICY OF PROVISION

ITEM	SERVICE & DESCRIPTION	USE	AUTHORIZATION	ACCOUNTING	REMARKS
1.	Switchboards and associated lines and equipment. Switchboards, Tie Lines, Trunk Lines, Battery Lines, Generator or Ringing Lines, Local Lines, Telephone sets, Exterior Lines, Keys, Bells, etc.	Administrative and operational requirements in the various Commands or Districts. Command or operational requirements in the various Commands or Districts.	(1) All new or additional telephone service or major moves or changes in existing facilities must be authorized by N.D.H.Q. Switchboards, Trunks and Handset instruments must have the specific approval of the Treasury Board. (2) One wall type telephone may be installed in officers quarters provided connection is made to Army owned or rented switchboard and no special charges are involved. (3) All applications for telephone service as listed under this item must be submitted in triplicate to N.D.H.Q. on form No. 404. Where Treasury Board approval is necessary four copies will be submitted. (4) These forms are made out by the Command or District Signal Officer concerned taking into consideration the comments listed under Remarks. In the case of the tie trunks or trunk lines a traffic study must accompany the application form 404.	(1) When completed and approved, Form No. 404 becomes the authority for the Command or District Treasury Officer concerned to pay the accounts. (2) All accounts are co-ordinated by the Command or District Signal Officer and coded against the "F.S.S." Rented or Leased Financial Encumbrance which is forwarded to the Command or District at the first of each fiscal year. (3) Frequently construction charges are involved in a rented switchboard installation for the Dept. On receipt of Const. F.E. to cover work GOC in C or DOC may arrange local contracts with a Commercial Tel. Co. up to $10,000; the Deputy Minister's and Dept of Munitions & Supply's authority being arranged at NDHQ prior to issue of F.E.	(1) Rented or leased installations will only be made after careful consideration has been given to the following:- (a) The military necessity of new or additional switchboard facilities. (b) The necessity for additional operators. (c) The necessity for additional trunks or tie trunks involving traffic studies etc. (d) The existing facilities, if any, involving use of bridged lines etc. (e) The possibility of installing Army owned telephone facilities if economical to do so. (2) Rented or leased switchboards etc. will rarely be used for operational requirements except where urgently required or as an interim measure pending installation of Army owned equipment. The installation of a rented operational switchboard etc which is an adjunct to or evolves from the approved defence programme, may be authorized by the GOC in C or DOC and one copy of application Form No. 404 forwarded to NDHQ for record purposes
2.	Individual Telephones including key equipments, telephone wiring plans, extension bells etc. leased directly from Commercial Communication Companies and not associated with any Army owned or rented switchboard.	Administrative and operational requirements in the various Command & Districts.	(1) All new or additional individual telephones must be authorized by NDHQ. Requests for service are to be submitted in triplicate to NDHQ on form No. 404. (2) Where there is insufficient time to make an application in the regular manner GO'sC in C and DO'sC may authorize:- (a) Single wall or desk type telephones in other than messes or quarters. (b) Minor relocations of equipment in other than messes or quarters. (3) Individual telephones in officers, NCO's or other ranks messes or quarters will not be authorized as a charge against Public Funds. (4) Pay stations which are not a charge against Public Funds may be installed in messes, quarters, canteens etc. at the discretion of the GO'sC in C and DO'sC concerned. (5) All applications for telephone service as covered by this item are prepared by the Command or District Signal Officer concerned taking into consideration the comments listed under Remarks.	(1) When completed and approved, Form No. 404 becomes the authority for the Command or District Treasury Officer concerned to pay the accounts. (2) All accounts are co-ordinated by the Command or District Signal Officer and coded against the "F.S.S." Rented or Leased Financial Encumbrance which is forwarded to the Command or District at the first of each fiscal year. (3) In accordance with the Consolidated Revenue Act of Canada, revenue accruing from pay stations, located in any building, barracks, mess, canteen etc., under the jurisdiction of NDHQ is to be paid to the credit of the Rec.-Gen. of Canada.	(1) Handsets, sometimes referred to as Cradle telephones, Uniphones, or Monophones will not be installed where the monthly rental exceeds that of desk sets except with the specific approval of the Treasury Board. (2) Individual telephones will not be installed where party lines or extensions are suitable. (3) Wiring plans will only be installed in such cases where it is economical to do so.

ITEM	SERVICE & DESCRIPTION	USE	AUTHORIZATION	ACCOUNTING	REMARKS
3.	Private Lines: Operational point to point full time talking circuits terminated on Army owned or rented telephones or concentrators.	These lines are normally required for C.D. or A.A. operational control between or within Defended Areas of a District or Command.	(1) All private lines must be authorized by NDHQ prior to installation. Three copies of form No. 404 will be submitted to NDHQ.	(1) When completed and approved, Form No. 404 becomes the authority for the Command or District Treasury Officer concerned to pay the accounts. (2) All accounts are co-ordinated by the Command or District Signal Officer and coded against the "F.S.S." Rented or Leased Financial Encumbrance which is forwarded to the Command or District at the first of each fiscal year. (3) Frequently construction charges are involved in a rented private line installation for the Dept. On receipt of Const. F.E. to cover work GOC in C or DOC may arrange local contracts with a Commercial Tel. Co. up to $10,000; the Deputy Minister's and Dept of Munitions & Supply's authority being arranged at NDHQ prior to issue of F.E.	(1) Where time or operational necessity does not permit regular submission of application, wired approval will be requested. If approved one copy of application will be forwarded as soon as possible.
4.	Pole Line Attachments: Pin space or pole space rented from a Commercial Company for erection of Army owned wire facilities.	Pole line attachment rentals are required within a Command or District in order to develop Army owned operational communication plant over existing pole lines rather than attempt to construct a new pole lead.	(1) Pole line attachment rentals generally involves the erection of wire facilities which are an adjunct to or evolves from the approved defence programme and may be authorized by the GOC in C or DOC concerned. (2) A signed contract or agreement must be obtained from the Commercial Company concerned and forwarded in quintuplicate to NDHQ for signature and seal of the Crown.	Pole line attachment accounts are usually paid yearly and are charged against the "F.S.S." Rented or Leased Financial Encumbrance. Payment of accounts by the District Treasury Officer may be supported by a copy of the signed Contract or agreement.	
5.	Telephone Long Distance Toll Charges	(1) Army controlled telephones either Army owned or rented will not be used to place "Long Distance Telephone Calls" except in cases of extreme urgency and importance. (2) Long distance telephone calls relating to leave or other matters of a private nature will not be allowed as a charge against Public Funds. (3) Army controlled telephones either Army owned or rented will not be used to place personal "Long Distance Telephone Calls" unless exceptional circumstances render such a course imperative.	(1) A "Long Distance" form must be made out on completion of every long distance telephone call placed over an Army controlled telephone. All such calls placed through an Army owned or rented switchboard are recorded by the operator on form No. 411. In all other cases the officer or such personnel as are authorized to make long distance calls, will make out a form 412 on the completion of each call. (2) The responsibility for allowing personal long distance calls to be made over Army controlled telephones and collecting toll charges involved will rest solely with the Officer Commanding the Unit or Establishment concerned.	(1) Forms No. 411 and 412 are required to support the payment of associated Commercial Telephone Companies account. (2) All authorized accounts are charged against the "F.S.S." Rented or Leased Financial Encumbrance. (3) Personal long distance telephone accounts must be paid for by Rec.-Gen. cheque. This cheque and certified account will be required to support payment by Dist. Treas. Officer.	(1) Actually personal long distance telephone calls may be made in any one of the following three methods. (a) Reverse the charges. (b) Request the operator to charge the call to a private subscriber's telephone number, with the calling party taking responsibility for payment. (c) At the conclusion of the call ascertain the cost, including tax and make out a cheque in favour of the Rec.-Gen. for the full amount and attach it to form 411 or 412 as applies.

ITEM	SERVICE & DESCRIPTION	USE	AUTHORIZATION	ACCOUNTING	REMARKS
6.	Telegram charges	(1) Telegrams relating to leave or other matters of a private nature will not be allowed as a charge against Public Funds. (2) Commercial Telegrams are authorized for the following purposes: (a) Contacting personnel while on leave (official). (b) Passing urgent official messages which cannot be handled by Canadian Army Signal System due to lack of facilities or conditions beyond their control. (c) All officers and other ranks returning from overseas may send two personal telegrams chargeable to Public Funds as follows:- (i) To his next-of-kin, notifying of his safe arrival in Canada. (ii) From his District Depot or District reception point to his next-of-kin notifying of the time of arrival of the train at his home city or town. (d) As an official means of passing urgent messages to destinations not served by a CASS Army Signal Office. (3) Telegrams relating to leave or other matters of a private nature will not be made over the facilities of the Canadian Army Signal System.		(1) Accounts for messages sent by telegraph must be supported by copies of such messages. (2) Should a "collect" telegram, relating to leave or other matters of a private nature, originating at a unit or establishment become uncollectable, the officer Commanding the unit or establishment is held responsible for payment.	
7.	Teletype Lines and Equipment	Operational and administrative communication between NDHQ and the various Commands and Districts between Commands and Defended Areas or Districts between Districts etc. The various networks function as part of the Canadian Army Signal System.	(1) All teletype circuits and equipment must be authorized by NDHQ and provision arranged by NDHQ through Dept of Munitions & Supply, Ottawa.	(1) Accounting for all Districts other than those included in Atlantic and Pacific Commands is arranged by NDHQ. (2) Funds being provided in the F.S.S. Teletype Financial Encumbrance.	

APPENDIX
TO
ROUTINE ORDER

4961

RENTED OR LEASED FIXED SIGNAL SERVICES

POLICY OF PROVISION

APPENDIX TO ROUTINE ORDER NO. 4961

RENTED OR LEASED FIXED SIGNAL SERVICES POLICY OF PROVISION

ITEM	SERVICE AND DESCRIPTION	USE	AUTHORIZATION	ACCOUNTING	REMARKS
1.	**Switchboards and associated lines and equipment.** Switchboards, Tie Lines, Trunk Lines, Battery Lines, Generator or Ringing Lines, Local Lines, Telephone sets, Exterior Lines, Keys, Bells, etc.	Administrative and operational requirements in the various Commands or Districts. Command or operational requirements in the various Commands or Districts.	(1) All new or additional telephone service or major moves or changes in existing facilities must be authorized by N.D.H.Q. Switchboards, Trunks and Handset instruments must have the specific approval of the Treasury Board. (2) One wall type telephone may be installed in officers quarters provided connection is made to Army owned or rented switchboard and no **special** charges are involved. (3) All applications for telephone service as listed under this item must be submitted in triplicate to N.D.H.Q. on form No. 404. Where Treasury Board approval is necessary four copies will be submitted. (4) These forms are made out by the Command or District Signal Officer concerned taking into consideration the comments listed under Remarks. In the case of the tie trunks or trunk lines a traffic study must accompany the application form 404.	(1) When completed and approved, Form No. 404 becomes the authority for the Command or District Treasury Officer concerned to pay the accounts. (2) All accounts are co-ordinated by the Command or District Signal Officer and coded against the "F.S.S." Rented or Leased Financial Encumbrance which is forwarded to the Command or District at the First of each fiscal year. (3) Frequently construction charges are involved in a rented switchboard installation for the Dept. On receipt of Const. F.E. to cover work, GOC in C or DOC may arrange local contracts with a Commercial Tel. Co. up to $10,000; the Deputy Minister's and Dept. of Munitions and Supply's authority being arranged at NDHQ prior to issue of F.E.	(1) Rented or leased installations will only be made after careful consideration has been given to the following:— (a) The military necessity of new or additional switchboard facilities. (b) The necessity for additional operators. (c) The necessity for additional trunks or tie trunks involving traffic studies, etc. (d) The existing facilities, if any, involving use of bridged lines, etc. (e) The possibility of installing Army owned telephone facilities if economical to do so. (2) Rented or leased switchboards, etc. will rarely be used for operational requirements except where urgently required or as an interim measure pending installation of Army owned equipment. The installation of a rented operational switchboard, etc. which is an adjunct to or evolves from the approved defense programme may be authorized by the GOC in C or DOC and one copy of application Form No. 404 forwarded to NDHQ for record purposes.
2.	**Individual Telephones** including key equipments, telephone wiring plans, extension bells, etc., leased directly from Commercial Communication Companies and not associated with any Army owned or rented switchboard.	Administrative and operational requirements in the various Commands or Districts.	(1) All new or additional individual telephones must be authorized by NDHQ. Requests for service are to be submitted in triplicate to NDHQ on form No. 404. (2) Where there is insufficient time to make an application in the regular manner GO'sC in C and DO'sC may authorize:— (a) Single wall or desk type telephones in other than messes or quarters. (b) Minor relocations of equipment in other than messes or quarters.	(1) When completed and approved, Form No. 404 becomes the authority for the Command or District Treasury Officer concerned to pay the accounts. (2) All accounts are co-ordinated by the Command or District Signal Officer and coded against the "F.S.S." Rented or Leased Financial encumbrance which is forwarded to the Command or District at the first of each fiscal year.	(1) Handsets, sometimes referred to as Cradle telephones, Uniphones, or Monophones will not be installed where the monthly rental exceeds that of desk sets except with the specific approval of the Treasury Board. (2) Individual telephones will not be installed where party lines or extensions are suitable.

APPENDIX TO ROUTINE ORDER NO. 4961—*Con.*

RENTED OR LEASED FIXED SIGNAL SERVICES POLICY OF PROVISION—Concluded

ITEM	SERVICE AND DESCRIPTION	USE	AUTHORIZATION	ACCOUNTING	REMARKS
			(3) Individual telephones in officers, NCO's or other ranks messes or quarters will **not** be authorized as a charge against Public Funds. (4) Pay stations which are not a charge against Public Funds may be installed in messes, quarters, canteens etc., at the discretion of the GO'sC in C and DO'sC concerned. (5) All applications for telephone service as covered by this item are prepared by the Command or District Signal Officer concerned taking into consideration the comments listed under Remarks.	(3) In accordance with the Consolidated Revenue Act of Canada, revenue accruing from pay stations, located in any building, barracks, mess, canteen, etc., under the jurisdiction of NDHQ is to be paid to the credit of the Rec. Gen. of Canada.	(3) Wiring plans will only be installed in such cases where it is economical to do so.
3.	**Private Lines:** Operational point to point full time talking circuits terminated on Army owned or rented telephones or concentrators.	These lines are normally required for C.D. or A.A. operational control between or within Defended Areas of a District or Command.	(1) All private lines must be authorized by NDHQ prior to installation. Three copies of form No. 404 will be submitted to NDHQ.	(1) When completed and approved, Form No. 404 becomes the authority for the Command or District Treasury Officer concerned to pay the accounts. (2) All accounts are co-ordinated by the Command or District Signal Officer and coded against the "F.S.S." Rented or Leased Financial Encumbrance which is forwarded to the Command or District at the first of each fiscal year. (3) Frequently construction charges are involved in a rented private line installation for the Dept. On receipt of Const. F.E. to cover work GOC in C or DOC may arrange local contracts with a Commercial Tel. Co. up to $10,000; the Deputy Minister's and Dept of Munitions & Supply's authority being arranged at NDHQ prior to issue of F.E.	(1) Where time or operational necessity does not permit regular submission of application, wired approval will be requested. If approved one copy of application will be forwarded as soon as possible.

APPENDIX TO ROUTINE ORDER NO. 4961—*Con.*

RENTED OR LEASED FIXED SIGNAL SERVICES POLICY OF PROVISION—Continued

ITEM	SERVICE AND DESCRIPTION	USE	AUTHORIZATION	ACCOUNTING	REMARKS
4.	**Pole Line Attachments:** Pin space or pole space rented from a Commercial Company for erection of Army owned wire facilities.	Pole line attachment rentals are required within a Command or District in order to develop Army owned operational communication plant over existing pole lines.	(1) Pole line attachment rentals generally involve the erection of wire facilities which are an adjunct to or evolve from the approved defence programme and may be authorized by the GOC in C or DOC concerned. (2) A **signed** contract or agreement must be obtained from the Commercial Company concerned and forwarded in quintuplicate to NDHQ for signature and seal of the Crown.	Pole line attachment accounts are usually paid yearly and are charged against the "F.S.S." Rented or Leased Financial Encumbrance. Payment of accounts by the District Treasury Officer may be supported by a copy of the signed Contract or agreement.	
5.	**Telephone Long Distance Toll Charges.**	(1) Army controlled telephones either army owned or rented will not be used to place "Long Distance Telephone Calls" except in cases of **extreme urgency and importance.** (2) Long distance telephone calls relating to leave or other matters of a private nature will not be allowed as a charge against Public Funds. (3) Army controlled telephones either Army owned or rented will not be used to place personal "Long Distance Telephone Calls" unless exceptional circumstances render such a course imperative.	(1) A "Long Distance" form must be made out on completion of every long distance telephone call placed over an Army controlled telephone. All such calls placed through an Army owned or rented switchboard are recorded by the operator on form No. 411. In all other cases the officer or such personnel as are authorized to make long distance calls, will make out a form 412 on the completion of each call. (2) The responsibility for allowing personal long distance calls to be made over Army controlled telephones and collecting toll charges involved will rest solely on the Officer Commanding the Unit or Establishment concerned.	(1) Forms No. 411 and 412 are required to support the payment of associated Commercial Telephone Companies account. (2) All authorized accounts are charged against the "F.S.S." Rented or Leased Financial Encumbrance. (3) Personal long distance telephone accounts must be paid for by Rec.-Gen. cheque. This cheque and certified account will be required to support payment by Dist. Treas. Officer.	(1) Actually personal long distance telephone calls may be made in any one of the following three methods:— (a) Reverse the charges. (b) Request the operator to charge the call to a private subscriber's telephone number, with the calling party taking responsibility for payment. (c) At the conclusion of the call ascertain the cost, including tax and make out a cheque in favour of the Rec.-Gen. for the full amount and attach it to form 411 or 412 as applies.
6.	**Telegram charges**.....	(1) Telegrams relating to leave or other matters of a private nature will not be allowed as a charge against Public Funds. (2) Commercial Telegrams are authorized for the following purposes:— (a) Contacting personnel while on leave (official).		(1) Accounts for messages sent by telegraph must be supported by copies of such messages. (2) Should a "collect" telegram, relating to leave or other matters of a private nature, originating at a unit or establishment become uncollectable, the Officer Commanding the unit or establishment is held responsible for payment.	All messages for transmission will be handed in to the nearest Army Signal Office by messenger whenever feasible to avoid telephone errors. Confirmation copies of messages filed via telephone will be passed to the Army Signal Office as soon as possible. Messages for transmission and confirmation copies of phoned messages must carry the originator's signature and appointment. Messages will not be passed direct to Commercial landline offices for transmission except where unavoidable.

APPENDIX TO ROUTINE ORDER No. 4961—*Con.*

RENTED OR LEASED FIXED SIGNAL SERVICES POLICY OF PROVISION

ITEM	SERVICE AND DESCRIPTION	USE	AUTHORIZATION	ACCOUNTING	REMARKS
		(b) Passing urgent official messages which cannot be handled by Canadian Army Signal System due to lack of facilities or conditions beyond their control. (c) All officers and other ranks returning from overseas may send two personal telegrams, limited to ten words each and chargeable to Public Funds as follows: (i) To his next-of-kin, notifying of his safe arrival in Canada. (ii) From his District Depot or District reception point to his next-of-kin notifying of the time of arrival of the train at home city or town. (d) As an official means of passing urgent messages to destinations not served by a CASS Army Signal Office. (3) Telegrams relating to leave or other matters of a private nature will not be sent over the facilities of the Canadian Army Signal System.		(3) The Command or District Signal Officers are responsible for the accounting of all telegrams within the Command or District concerned. (4) D Sigs is responsible for the accounting of all telegrams at NDHQ.	
7.	**Teletype Lines and Equipment**.....	Operational and administrative communication between NDHQ and the various Commands and Districts, between Commands and Defended Areas or Districts between Districts, etc. The various networks function as part of the Canadian Army Signal System.	(1) All teletype circuits and equipment must be authorized by NDHQ and provision arranged by NDHQ through Dept. of Munitions and Supply, Ottawa.	(1) Teletype accounts in Atlantic and Pacific Commands are certified by the C.S.O. and forwarded to the Treasury Officer for payment. These accounts are supported by an Acceptance of Tender issued by the Dept. of Munitions and Supply. (2) All other teletype accounts are certified by D Sigs and forwarded to the Chief Treasury Officer for payment. (3) Funds are provided in the F.S.S. **Teletype** Financial Encumbrance.	

APPENDIX "D"

TRAFFIC STUDY / DEC. 9th, 10, & 11th, 1943

		Instd.	Wkg.
Attd.	Positions 600-C	3	3
Local	Stations	120	120
C.O.	Trunks	40	33

Office B.H. CALLS, UNITS, POSITION REQUIREMENTS

	Dec.9	Dec.10	Dec.11	Avge.	Coeff.	Units
Local to Local	114	131	123	123	.90	111
Outgoing-Attd.-Hang Up	1	-	-	1	5.36	5
" -Station	313	288	386	329	.90	296
" -Tie Trunk	-	17	16	11	.90	10
Incoming from C.O.	298	293	379	323	1.15	371
" Tie Trunk	-	12	24	12	1.15	14
Total	726	741	928	799		807
Mod. Units	-10%					726
Pos. Req'd	220 Units/Pos.					3.3
Max. cords in use	32	34	40			
" trks " "	29	28	33			
No Times All Trunks Busy	-	-	5			
" " Trks. refused	-	-	15			

HOURLY CALLS

		Outgoing			Incoming		
Dec.9th 1943	Local to Local	Att'd Hang Up	Stn.	Tie Trk.	From C.O.	Tie Trk.	Total
9-10	113	-	235	-	219	-	567
10 -11	80	-	289	5	302	-	676
11 -12	124	7	281	-	263	-	675
12 - 1	53	-	148	-	150	-	351
1 - 2	15	-	157	-	107	-	279
2 - 3	125	1	243	-	232	-	601
3 - 4	128	1	266	-	235	-	630
4 - 5	(114)	1	(313)	-	(298)	-	(726)
TOTAL	752	10	1932	5	1806	-	4505

* The greatest No. of calls were between 4 - 5. This then the Office Busy Hour.

HOURLY UNITS - HOURLY POSITION REQUIREMENTS

	Local	Outgoing			Incoming				
Dec.9th,1943	to Local	Att'd Hang Up	Stn.	Tie Trk.	From C.O.	Tie Trk.	Units Total	Mod.	Pos. Req'd
9 - 10	102	-	212	-	252	-	566	509*	2.3
10 - 11	72	-	260	5	347	-	684	616	2.8
11 - 12	112	38	253	-	302	-	705	635	2.9
12 - 1	48	-	133	-	173	-	354	319	1.4
1 - 2	14	-	141	-	123	-	278	250	1.1
2 - 3	113	5	219	-	267	-	604	544	2.5
3 - 4	115	5	239	-	270	-	629	566	2.6
4 - 5	103	5	282	-	343	-	733	660	3.0

* In deciding the position requirements on a wartime basis, when units are less than 500, 5% is deducted before computing position requirements. If units are in excess of 500, deduct 10%

NAME
ADDRESS

BUSY REPORT

PENDIX "D"

Tel. Nos. to be Studies

Days for Study April 3 - 4 - 5

Numbers of In and Out Calls with Holding Time in Minutes

Date	Circuit Numbers	9-10		10-11		11-12		12-1		1-2		2-3		3-4		4-5		5-6	Total	
		C	M	C	M	C	M	C	M	C	M	C	M	C	M	C	M		Calls	Minutes
April 3 - Lombard	2181	39	47.7	23	55.1	37	49.4	22	41.8	23	44.1	43	48.1	20	46.8	33	50.8		240	384.4
"	2182	22	37.2	35	46.6	22	51.8	14	42.5	19	32.0	28	49.0	24	51.0	33	44.8		197	354.9
"	2183	13	38.9	18	44.0	18	51.4	13	24.9	17	42.0	20	49.5	17	39.0	26	35.7		142	325.4
"	2184	24	27.7	37	39.8	39	49.7	13	17.9	21	30.1	29	46.6	18	44.9	26	41.4		202	298.1
"	2185	11	23.7	17	30.6	19	50.9	3	18.6	17	19.7	22	36.9	14	43.8	25	29.2		128	253.4
"	2186	22	18.6	13	44.3	25	46.9	10	33.6	10	27.6	24	44.6	26	40.1	21	39.2		151	294.9
"	2187	8	15.5	12	21.7	30	33.4	8	7.2	13	14.6	27	40.5	13	36.5	21	22.8		132	192.2
"	2188	18	28.4	18	36.6	25	46.3	14	29.0	9	14.6	21	42.8	20	41.8	25	45.9		150	285.4
"	2189	10	15.7	20	25.6	22	40.0	1	5.4	5	8.9	20	36.7	24	36.8	18	33.4		120	202.5
"	2190	9	22.5	26	26.3	21	45.9	13	24.9	15	22.5	18	36.3	18	25.4	12	38.5		132	242.3
"	2191	14	19.1	11	22.4	19	28.7	11	27.6	8	7.6	24	39.6	14	23.5	28	30.8		129	199.3
"	2192	17	25.3	11	20.4	21	28.8	1	5.3	2	2.9	16	32.8	19	37.9	13	27.7		100	181.1
"	2193	6	11.1	11	21.3	28	29.7	2	4.5	-	-	11	24.1	13	20.4	12	25.4		83	136.5
"	2194	9	10.1	10	13.5	10	20.4	2	3.5	1	.2	15	19.7	12	20.8	9	26.8		68	115.0
		222	341.5	257	448.2	336	573.3		286.7	160	267.4	318	547.2		508.7	302	492.4		1974	3465.4

Average Minutes Lines Used in Average Busy Hour 573

Number of Calls Rejected 50

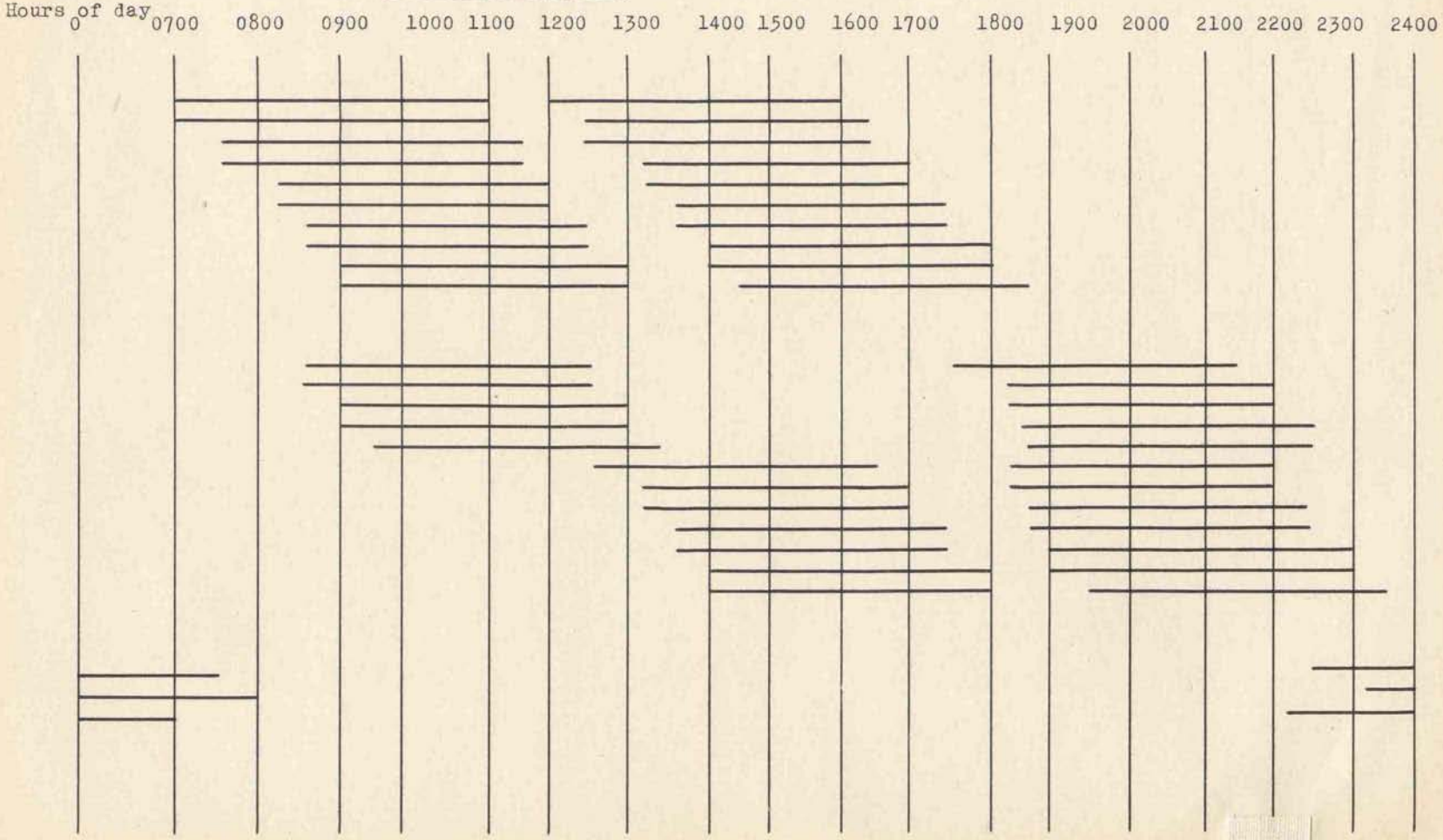
C - Calls
M - Minutes

The Busy Hour, according to the study, is 11 - 12

APPENDIX "D"

STANDARD OPERATING TRICKS

ARMY PBX SWITCHBOARD



Hours of Operation-0800 to 1800 except Sat & Sun
0800 to 1500 Saturday
0800 to 1300 Sunday

13, 14, 15 & 16 Mar 44

	0000 0800	0800 0900	0900 1000	1000 1100	1100 1200	1200 1300	1300 1400	1400 1500	1500 1600	1600 1700	1700 1800	1800 1900	1900 2000	2000 2100	2100 2200	2200 2300	2300 2400	
Calls 13 Mar 44		32	89	90	70	39	52	92	72	52	42							
14 Mar 44		36	90	95	65	36	54	82	88	57	46							
15 Mar 44		30	105	104	87	51	59	85	88	62	43							
16 Mar 44		38	93	96	62	40	48	93	84	52	40							
Average		34	94	96	71	41	53	88	83	56	43							
Calls 175																		1 Operator
0																		0
No. of Ops. reqd		1	1	1	1	1	1	1	1	1	1							
Op. #1																		
Relief Op.																		
Night Connections																		

Note:- On Saturdays, there are night connections from 0000 to 0800 and from 1500 to 2400 hours and on Sundays, there are night connections from 0000 to 0800 and from 1300 to 2400 hours.

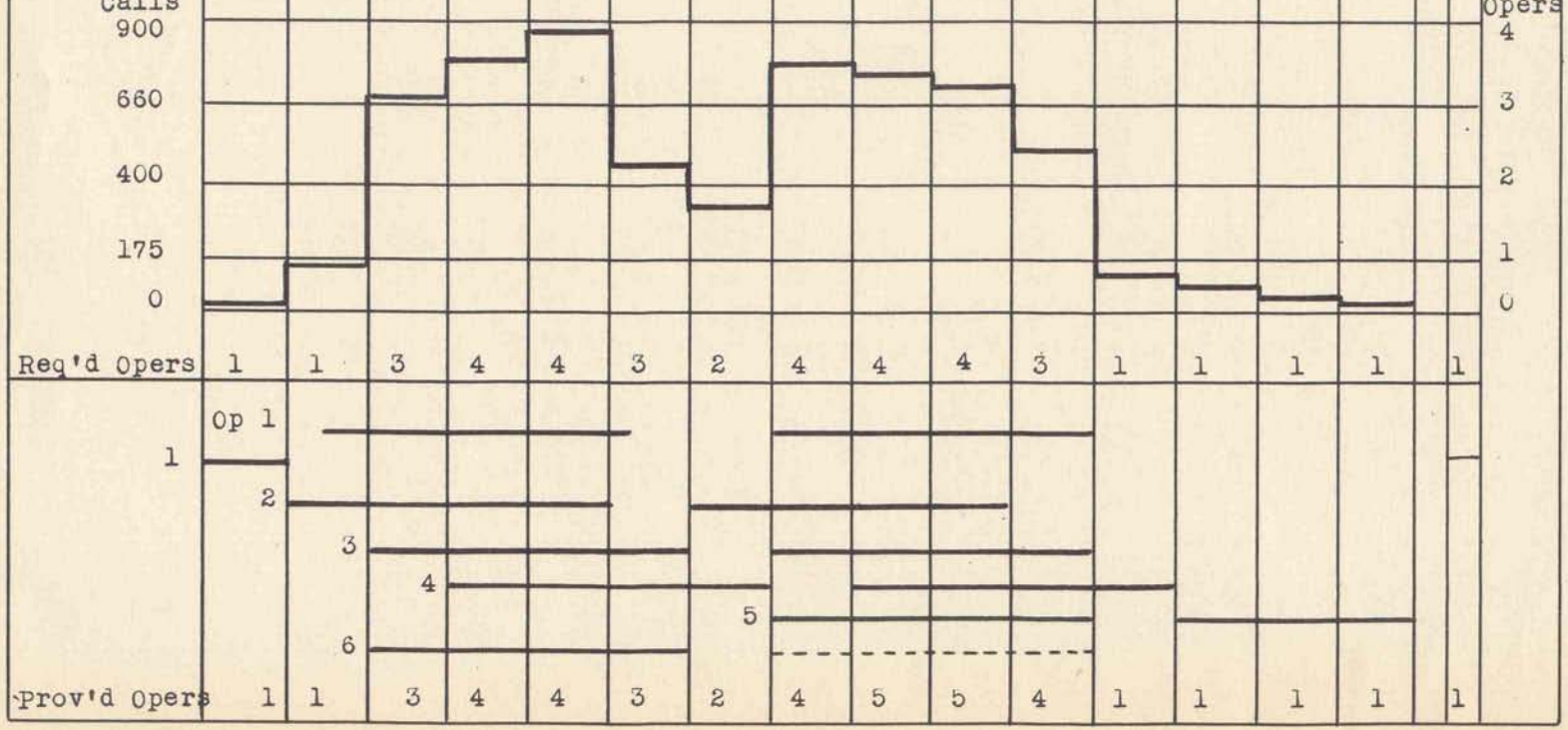
27, 28 & 31 Jan 44

Hours of Operation - 0800 to 2200 daily

	0000 0800	0800 0900	0900 1000	1000 1100	1100 1200	1200 1300	1300 1400	1400 1500	1500 1600	1600 1700	1700 1800	1800 1900	1900 2000	2000 2100	2100 2200	2200 2300	2300 2400	
Units (Calls weighted by B.T. Co.) 27 Jan 44			695	1032	1081	569	339	813	908	1163								
28 Jan 44			647	628	1175	432	560	897	1027	1163								
31 Jan 44			1087	1073	1150	609	403	997	1062	1039								
Average			810	911	1135	537	434	902	999	1122								
Units 1125																		5 Operators
900																		4
660																		3
400																		2
175																		1
0																		0
No. of Ops. req'd		1	4	4	5	3	3	4	5	5	3	2	2	2	2			
Mon. to Sat. incl.																		
Mon. to Sat. Incl. (Supervisor																		
(Op. #1																		
(" #2																		
(" #3																		
(" #4																		
(" #5																		
(" #6																		
1 relief supervisor and 2 relief operators for Sundays and absence.																		

20 to 23 Dec 43

Hours	0000 0800	0800 0900	0900 1000	1000 1100	1100 1200	1200 1300	1300 1400	1400 1500	1500 1600	1600 1700	1700 1800	1800 1900	1900 2000	2000 2100	2100 2200	2200 2400	0000 0000
Calls 1 Day	12	121	766	688	941	447	321	712	752	778	608	125	70	47	30		18
2 Day	14	144	697	856	767	480	341	1012	693	656	561	98	71	38	48		38
3 Day	13	116	497	842	906	467	408	712	812	766	422	164	65	34	29		26
4 Day	25	220	719	719	811	431	268	585	683	603	429	102	67	37	21		64
Ave.	16	150	670	776	856	456	335	755	735	701	505	122	68	39	32		36
Req'd Opers	1	1	3	4	4	3	2	4	4	4	3	1	1	1	1		1
Prov'd Opers	1	1	3	4	4	3	2	4	5	5	4	1	1	1	1		1



FORM 404 DEPARTMENT OF NATIONAL DEFENCE - ARMY

Application For Authority To Install New or Additional Telephone Facilities

To - Secretary, Dept. Nat. Def.
Ottawa, Ont.

ATTENTION - Director of Signals

This application must be prepared in triplicate. Upon approval two (2) copies will be returned, one (1) of which must be passed to the District Treasury Office.

Application No.....
Date.....194....
Location.....
.....
.....
.....
Command.....
District.....

1. Equipment

	Present No.	Present Monthly Rental	Proposed No.	Proposed Monthly Rental	Proposed NIR Inst. Charge
(A) Switchboard Capacity (and type).....					
(B) " Positions.....					
*(C) " Trunk Lines.....					
ø(D) " Locals.....					
ø(E) " Ext. From Locals.....					
ø(F) Individual Business Lines.....					
ø(G) Ind. Bus. Extensions.....					
*(H) Tie Lines or Trunks(Terminating on PBX's).....					
(I) Private Lines (Terminating on Sets)...					
(J) Leased Circuits.....					
(K) Misc. Equip. (Detail).....					
.....					
.....					
.....					
.....					
(L) Operating Personnel - C.W.A.C.....	XXX		XXX		XXX
- ARMY.....	XXX		XXX		XXX
- CIVILIAN.....	XXX		XXX		XXX
(M) TOTAL -	XX		XX		

Served from the .....Exchange of the .....
(Telephone Company)

* If new or additional trunk or tie lines are required, traffic studies by Local Telephone Company must be obtained to cover as long a period as possible and attached to this application. Also attach list showing terminating points of tie lines, private lines and leased circuits.

ø Attach list of users showing Tel. No., Name, Appointment or Department, existing and proposed.

2. Outside Plant - Owned by D.N.D. (Cable, Open wire, drop wire etc.)

DESCRIPTION OF EQUIPMENT OR MATERIALS	Material Cost	Supvr. and Labour Charges	Remarks
TOTAL			

NOTE - If possible attach print or drawing showing present and proposed plant distribution. Construction charge to be billed to D.N.D. amounting to $.....is in accordance with Attached copy of Telephone Company's recommendation and quotation.

3. Outline of reasons for and scope of proposed installation and construction as recommended.

4. After careful consideration of all the facts, I am convinced there is no possibility of providing the required service by the use of alternative equipment at a lower cost, re-arrangements of present equipment, or by other means, and that the equipment requested is **necessary** for the efficient carrying out of duties.

.....
G.O.C.-in-C. Command

.....
D.O.C. M.D. No.

Recommended for approval..... .....
D. Sigs.

Approved as to necessity..... .....
D.C.C.S.(C)

The above application is -

(A) Approved .....
Deputy Minister

(B) Denied

Date.....194..

(C) Not approved pending further recommendation as follows -

REPORT OF TELEPHONE EQUIPMENT IN USE AT
CLOSE OF FISCAL YEAR 194...

FORM 405

MILITARY DISTRICT NO....COMMAND.....

EQUIPMENT	NO. IN USE	ANNUAL RENTAL
Switchboard		$
Type.....	xx	xxx
Capacity.....	xx	xxx
No. of Pos.....	xx	xxx
Trunk Lines		
Local Wall Sets		
" Desk "		
" Hand " *		
" Ext. Wall Sets		
" " Desk "		
" " Hand " *		
Ind. Bus. Wall Sets		
" " Desk "		
" " Hand " *		
Bus. Ext. Wall Sets		
" " Desk "		
" " Hand "		
Tie Lines or Trunks		
Private Lines		
Leased Circuits		
Mis. Equip. (Detail).....	xx	
.....	xx	xxx
.....	xx	xxx
.....	xx	xxx
TOTAL ANNUAL RENTAL	xx	$

Total non-recurring installation charges paid during past fiscal year $.....

Total construction costs paid during past fiscal year $.....

Total operators' salaries paid during past fiscal year $.....

Date submitted.....194.....

.....
G.O.C.-in-C. Command
D.O.C. M.D. No.

* See Reverse.

* If hand telephones are in use, show following data for each set.

BY WHOM HAND SET IS USED	DATE OF INSTALLATION	AUTHORITY - H. Q. FILE

FORM 405A

LIST OF TELEPHONE USERS AT

CLOSE OF FISCAL YEAR 194..

SHEET NO........
OF......sheets.

MILITARY DISTRICT NO... COMMAND..........

LOCATION, APPOINTMENT OR NAME OF DEPARTMENT	TYPE OF SERVICE	LOCATION, APPOINTMENT OR NAME OF DEPARTMENT	TYPE OF SERVICE

Form 406

(Letter Head of Canadian Armed Service)

Place .....
Date .....194.....
File Ref. .....

.....
(Telephone Co.)

.....

Attention Mr. .....,Manager

Gentlemen:-

The undersigned hereby represents to the .....
..... in connection with the installation of
..... for .....
at.....

(i) That the provision and installation of telephone facilities is a military necessity, with the following exceptions and under the stated conditions.
.....
.....
.....
.....

(ii) That the minimum telephone facilities required are
.....
.....
.....

(iii) That the following action has been taken to reduce telephone facility requirements:
.....
.....
.....

(iv) That the following action has been taken to conserve critical materials:
.....
.....
.....

(v) That the required service date is .....

(vi) That H.Q. authority for the provision of the above telephone facilities is
.....
.....

Yours truly,

Signed.....

.....

FORM 407

PBX RECORD

Telephone No.
Exdale 1234-5-6

Military Dist No. 4

Command .....

Served from Montreal

Exchange of the Snafer Telephone Co. (Telephone Co)

Name Camp Brock

Location Mount Royal

(1) Service and Equipment	(2) Connected	(3) Disconnected	(4) Monthly Rental	(5) Installation Charge	(6) Remarks
1 pos 551 PBX	1 Mar 44		10.00		appl 72 D/20 Feb 24
3 Trks	"		30.00	14.00	"
1 Oper set	"		free		"
1 Battery CCT	"		1.00		" connected

Military District No. — The name of the district.

Command — Applicable to the Atlantic and Pacific Commands.

Served from — The name of the telephone central office that provides the service.

Name — The name of the camp, training centre or H.Q. that uses the service.

Location — The geographical location of the camp, training centre etc specified under the heading "Name".

Telephone Number — The numbers assigned to the PBX. This should include any one way trunk numbers connected to the PBX.

Item 1 — List of the equipment. (Rentals for PBX should include rate for battery circuit, ringing circuit, or any feature that is connected permanently to the board).

Items 2 and 3 — Self explanatory.

Item 4 — Monthly rental of each separate item.

Item 5 — Non-recurring service and installation charges.

Item 6 — Application No and date of same, which is authority for installation.

FORM 408

Telephone No
Exdale 1234-5-6
Local No...4....

LOCAL RECORD

Military Dis No....4..... Command.....

Name.....Camp Brock.....

Appointment...DOC - Brig. Grant.....

(1) Service and Equipment	(2) Connected	(3) Disconnected	(4) Monthly Rental	(5) Installation Charges	(6) Remarks
Desk	1 Mar 44		1.70	100	Appl. 72-D/20 Feb 44

Military Dist. No. — Same as on 407

Command — " " " 407

Name — " " " 407

Appointment — Name and rank of local user.

Telephone Number — P.B.X. Number and Local Number

Items 1-6 — Same as on 407

Number and Local Number

FORM 409

Leased Circuit - Tie Trunk or Private Line Record

Type	Mileage	Tel. No.	Originating Point	Terminating Point
Tie Trk	3/4	Exdale 1234	PBX Camp Brock	PBX DD 140 Pine St.
PL	5/4	3-2412	W. H.Q. M.D. 8	D Shed #46 - 10 Doe St.

Type — State whether tie trunk or privat line.

Mileage — The mileage that exists between originating and terminating points.

Telephone Number — This should be the telephone number of the telephone account to which the line is billed.

Originating Point — Address of point of origin and state whether line is from a PBX or a telephone set.

Terminating Point — Address of terminating point and state whether line terminates on a PBX or a telephone set.

FORM 410

Telephone No
...2-404....

Individual or Two Party Line Record

Military Dist. No....6.....
Served from.....Welland.....
Name.....H.Q.....
Appointment.....AA & QMG Capt J.R.Snoot

Command.....
Exchange....of the Nonsuch Telephone Co. (Telephone Company)
Location.....

(1) Service and Equipment	(2) Connected	(3) Disconnected	(4) Monthly Rental	(5) Installation Charge	(6) Remarks
1 BD	4 Mar 44		7.20	5.00	Appl #70 d/ 25 Feb 44

Military District No.	Same as on 407
Command	" " " 407
Served from	" " " 407
Name	" " " 407
Location	" " " 407
Appointment	Name and Rank of user
Items 1 - 6	Same as on 407

FORM 411 RECORD OF LONG DISTANCE CALL

DATE.....TIME.....

CALLED PLACE.....CALLED NUMBER.....

CALLED PERSON.....

TELEPHONE NUMBER.....LOCAL NUMBER.....

CALLING PERSON.....

OPERATORS REPORTS	REMARKS.....
.....	.....
.....	.....
.....	.....
.....	.....

Description of Form 411

This form must be completed by the P.B.X. operator for every Long Distance call that is placed over the facilities provided by a switchboard. The only exception to this is when the establishment is served by an Automatic switchboard which provides the local user with access to outgoing trunks without reference to the operator. Then the local user will be made responsible for recording details of the call in form 412 and forward this record to the Signal Officer at stated periods.

The various headings on the form require little clarification, however brief explanatory notes are shown below:-

Date:- Date of call.

Time:- Time of call.

Called place:- Name of city or town called.

Called number:- Distant telephone number.

Called person:- Name of called party. This information is required for person to person calls.

Telephone No.:- and Local No. The telephone number of the P.B.X. and local from which the call originates.

Calling person:- The name of the calling party.

Operators reports:- Information as "Don't answer or called party not there" will be placed here.

Remarks;- Miscellaneous information.

Form 412

DATE _____

PLACE CALLED _____

PARTY CALLED _____

APPROXIMATE DURATION OF CALL _____

SUBJECT _____

_____

INITIALS OF OFFICER CALLING _____

Description of Form 412

This form will be completed by telephone users of individual lines or locals served by an automatic P.B.X. The party placing the call will be responsible for recording the details and forwarding the form to the Signal Officer at stated periods. A brief explanation of the various heading are as follows:-

Date: - Date of call.

Place called:- Name of city or town called.

Party called:- Name of called party applies to person to person calls.

Approximate duration of call:- Number of minutes involved.

Subject:- Subject matter of call.

Initials of Officer:- Self explanatory.

FORM 413

INDIVIDUAL P.B.X. SUMMARY

Tel. No. Exdale 1234
5-6

(A) NAME _____ LOCATION _____

(B) TYPE OF SWITCHBOARD _____

NO. OF POSITIONS _____

NO. OF OPERATORS ARMY _____

CIVILIAN _____

Service and Equipment		PBX	Trks	H	D	W	Opr. Set	W.P.	X B	P.L.	Tie Trk	Batt. cct.						Total Rate		REMARKS
Conn.	Disc.	10.00	10.00	2.00	1.70	1.50	Free		.20			1.00								
1 Mar 44		1	3		1		1					1						42	70	
10 Apr 44			1	1		1			1									56	40	
	25 Jun 44		(1)															46	40	Exdale 1237.
									(C)											

Description of Form

(A)Name: Name of Camp, T.C., H.Q., etc.

Location: Geographical.

(B)Type of Switchboard)
)
No. of Positions) self explanatory.
)
No. of Operators)

(C)This part of the form is designed to provide details of equipment associated with the P.B.X. The 16 box spaces are for the purpose of itemizing the various services. Underneath is space for monthly rental of each item. The box spaces will be completed in accordance with requirements. It will be appreciated that the equipment items will vary, depending on the size and type of the P.B.X. After recording changes in equipment and service the total rate will be adjusted in the column provided under "Total Rate". The Remarks would ordinarily contain such items as the telephone number of the trunk or trunks connected or disconnected, or other pertinent information related to any increase or decrease. To make possible simple compilation of the various items listed, it will be noted from the sample that increases in equipment are not circled, whereas, decreases are circled. By subtracting the total of the items circled under any heading, the number of items in service, can be obtained. By maintaining a "total rate" column an immediate reference for checking against monthly accounts rendered is provided.

APPENDIX "E"

1. Typical First and Revised Estimate Sheets.
2. Typical Revote Sheet.
3. Chart showing Routing of First Estimates.
4. Chart showing Routing of Revised Estimates.

FIXED SIGNAL SERVICES

FORM - 505

ESTIMATES 194- 194-

VOTE 210 - 94

(A)

ARMY PROVISION TELEPHONE, TELETYPE WIRELESS

ITEM	SERVICE	DESCRIPTION	194- 194- FIRST ESTIMATE	194- 194- REVISED ESTIMATE	REMARKS
1	Telephone Construction	Coast Defence; AA Defence (Incl. Airports), Administrative H.Q. Fixed Training Areas and Army Camps (Permanently Located); Const. Charges in Connection with rented Equipment or Plant.			(First estimate amount will be rough (estimate only. Revised estimate will in (most cases be the same amount as shown (for first estimate, however complete (detail will be required for all projects (which are firm in order to enable funds (to be provided. Balance of funds will (be made available as an increase in F.E. (on receipt of further detailed estimates. ((
2	Wireless Construction	Antenna Networks; Ground Systems; Transmission Lines, Miscellaneous Hardware, labour, etc.,			
3	Telephone & Teletype Maintenance	Inside & Outside Plant Replacement Materials			
4	Wireless Maintenance	Inside & Outside Plant Replacement Materials			(Wireless Maintenance and all equipment (requirements are arranged at N.D.H.Q. (and consequently no estimate of funds
5	Telephone, Teletype, & Misc. Signals Equipment	Switchboards, Telephones, Amplifiers, Teletypes, Test Sets, Keys, Concentrators, etc. Wire Intercommunications Systems, Testing Apparatus, Signalling & Selector Equipment, Alarm Systems, Power Plants, etc.			(is required. A list of new telephone (and wireless equipment and use for which (required should be attached in order to (assist in determining bulk requirements. (
6	Wireless Equipment	Wireless Sets, Power Plants, Test Equipment, etc.			(((
		ARMY PROVISION TOTALS			

(B)
LEASED OR RENTED TELEPHONE & TELETYPE

ITEM	SERVICE	DESCRIPTION			
1	Rented or Leased Telephone Facilities	Total cost of items a, b, c, d, e, & f hereunder:-			
	(a)	Switchboards & Associated Lines & Equipment: Switchboards, PBX Tie Lines, Trunk Lines, Battery Lines, Generator or Ringing Lines, Local Lines & Station Equipment, Exterior Lines, Keys, Bells, etc. ($.....)	- - - -	- - - -	
	(b)	Individual Telephones including Key Equipment, etc: Telephone & Wiring Plans Leased Directly from Commercial Companies and not associated with any Army Owned or Rented Switchboard. ($.....)	- - - -	- - - -	Either First or revised estimates totals can be obtained from existing
	(c)	Private Lines. Operational point to point full time talking circuits - usually terminated on rented or Army Owned Telephones or Concentrators. ($.....)	- - - -	- - - -	Command or District records.
	(d)	Pole Line Attachments: Pin Space or Pole Space rented from Commercial Company for erection of Army Owned Wire facilities. ($.....)	- - - -	- - - -	
	(e)	Telephone L.D. Toll: Total Command or District charges ($.....)	- - - -	- - - -	
	(f)	Telegrams: Total Command or District Telegram Charges ($.....)	- - - -	- - - -	
2	Teletype Lines & Equipment	Point to Point lines and associated teletype Equipment			
		LEASED OR RENTED TOTALS			

FIXED SIGNAL SERVICES

REVOTE - FISCAL YEAR...............FORM 606

FE NO.	PROJECT	AMOUNT OF F.E. 1943 - 44	PASSED FOR PAYMENT	BALANCE	REVOTES REQUIRED 1943 - 44 FUND

FIXED SIGNAL SERVICES FIRST ESTIMATES

Parliament → Parliament votes on the Annual Army Estimates and if passed, a Privy Council Order is made out authorizing expenditures. This P. C. is forwarded to all Departments involved.

Treasury Board → Treasury Board on approval of Annual Army Estimates places them before Parliament.

Minister → The Minister National Defence (Army) approves or otherwise of Estimates and submits to Treasury Board.

Deputy Minister → Deputy Minister (Army) reviews and checks Annual Army Estimates and forwards to the Minister.

D.S.D. → D.S.D. co-ordinate all submissions and prepare complete Annual Army Estimates and forward to Deputy Minister (Army).

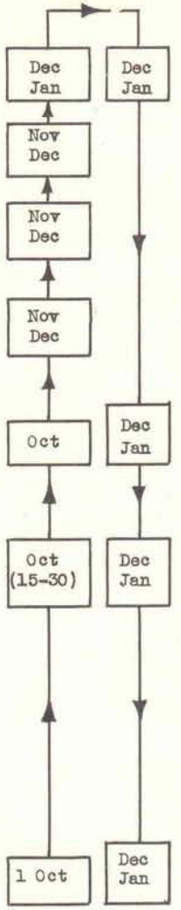
D. Sigs. → First estimates are checked by D. Sigs and any questions reviewed with the Command or District concerned. The total amount to be included in the Annual Army Estimates is then decided and a submission prepared for the Directorate of Staff Duties.

C.S.O. or D.S.O. → First or preliminary estimates are made up for the following fiscal year by the Chief Signal Officers or District Signal Officers and forwarded to NDHQ in October. The first estimate will comprise all Fixed Signal Services for the following fiscal year which the GOC-in-C or D.O.C. considers in the interest of the service and will include items as listed on Form 505. (It will be noted that no proviso is made for Wireless Maintenance or Army Pattern equipment since both of these items are ordnance provision and are not accounted for in signals primary (210-99). A Command or District Reserve will also be included. This reserve will not exceed 10% of the total estimate for the Command or 5% for the District, and is intended to provide funds in the Command or District for urgent operational requirements which cannot be foreseen and for which there would be insufficient time to submit an estimate.

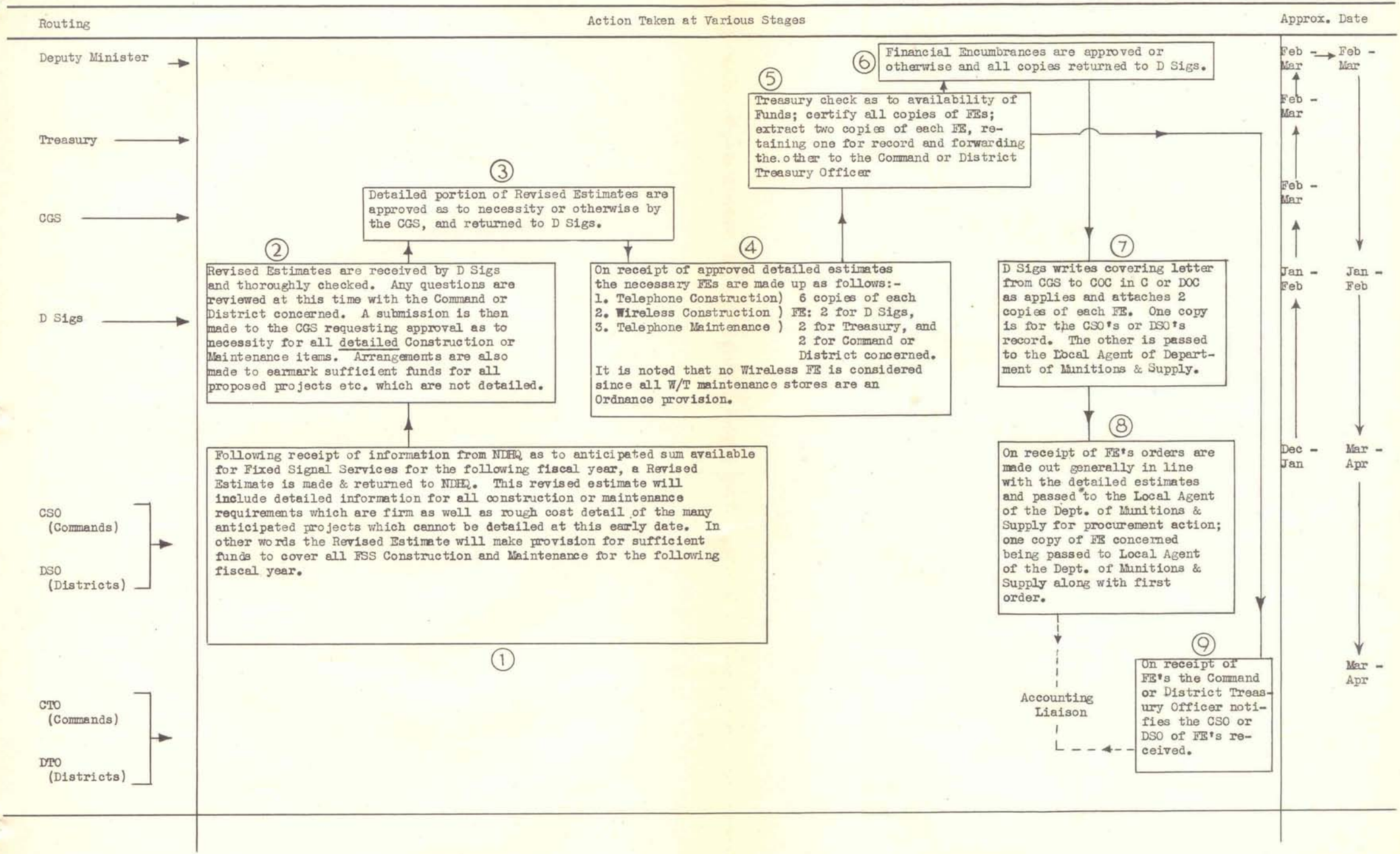
D.S.D. receive copy of P. C. and notify D. Sigs.

On receipt of confirmation from D. S. D. that Estimates are approved D. Sigs immediately notify Commands and Districts of the amount approved for Fixed Signal Services.

C.S.O's or D.S.O.'s on receipt of this information prepare revised estimates taking into consideration any changes which have taken place since submission of First Estimates.



FIXED SIGNAL SERVICES REVISED ESTIMATES
(A) Army Provision
(1) Telephone Construction
(2) Wireless Construction
(3) Telephone Maintenance



APPENDIX "F"

1. Transmission Characteristics of Command and Administrative Telephone Plant.

I. GENERAL AND TECHNICAL CONSIDERATIONS FOR ADMINISTRATIVE TELEPHONE PLANT

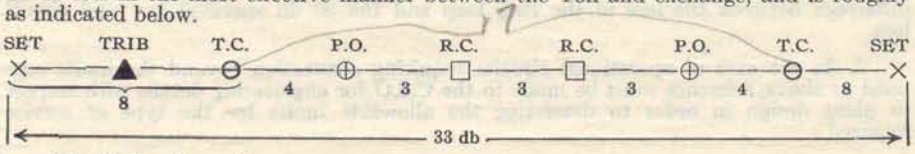
1. The army telephone plant in these areas will, for the most part, be operated within territory usually served by a Commercial Telephone Co. Every effort must be made to foster the closest co-operation between the army and the Commercial Telephone Co.

2. The reasons for this are twofold, (a) in many instances the commercial company is in a position to supply many of the services required by the army for the regular service rates, which makes for the best economy; and (b) in order that the best use may be made of the army system, connections must be available to the civilian exchange for connection anywhere outside the army area.

3. For the above reasons it is important that the Army telephone plant shall be designed to give at least as good transmission as the commercial company to which it will be connected. Inquiry at the Commercial Coy. will usually give the limits used in the design of their local plant. If these limits be such that they conform to the general Toll switching plan as set up for the North American Continent, then it should only be necessary to design the army plant to the same standards to enable the two systems to be tied together. This procedure will insure a high standard of local communications in the army system as well as good Toll connections.

4. The design of local telephone plant cannot be considered on the merits of local communication only, but must be done to agree with a general toll switching plan.

5. For the purpose of information this plan for the North American Continent is briefly outlined. Under this arrangement it is contemplated that a transmission loss of 33 db (effective rating) should not be exceeded on the longest switched connection if adequate service is to be provided. The plan is based on distributing this allowable 33 db loss in the most effective manner between the Toll and exchange, and is roughly as indicated below.



Set—Subscriber set
Trib—Tributary office
T.C.—Toll centre
P.O.—Primary outlet
R.C.—Regional Centre

6. To simplify the design problem, since there are no regional centres in Canada, the plant for the army network may be considered as that of a tributary office feeding into a Toll Centre. On this basis the overall loss between any set in the army network and the connection to the commercial exchange should not exceed 8 db (effective rating). On this basis any service radiating from the main army board should not exceed 4 db allowing 4 db for circuits between the army board and the commercial exchange, thus insuring good toll service to any point. Where no toll connection will be required, this limit may be increased to that outlined in the information set out for a Fortress or Defended Area. Generally, in command or Administration areas, 22 or 24 gauge cables should be used, except where 26 ga. may be warranted for some specific reason. For the purpose of information, approximate limits are given as an indication of the distances which may be expected with these cables to keep transmission within the 4 db limit making use of standard telephone cable. With 22 ga. cable to keep within this 4 db limit, the maximum length allowable would be about 2 miles; with 24 ga., this distance would be reduced to a mile and a half and where necessary to use 26 ga. the distance would be limited to short runs not exceeding a mile or a mile and a quarter. It must be borne in mind that if mixed gauges are used, additional losses will be encountered and the distance will be reduced proportionately. Increases in distances can be obtained by the proper use of loading, or cord circuit repeaters may be used to take care of special cases. If the circumstances warrant, it may be possible to reduce the loss in the link between the army system and the commercial system by the use of larger cable with proper loading, in which case the reduction in loss in this link may be passed along as an increase in the length of the army loops.

II. GENERAL AND TECHNICAL CONSIDERATION FOR COMMAND TELEPHONE PLANT

1. The primary requirement in setting up any communication system is to determine the ultimate purpose to which circuits of the system will be used, and plans made to design the plant in accordance with these ultimate requirements.

2. In a Fortress or Defended Area the focal point in the system is the F.C.P. switchboard and the maximum requirement of communication in this area will be a switched connection between the outer extremities of circuits in the area, plus the interconnection of one or more circuits for setting up a conference call.

3. As set out in policy for standardization in these areas, the general use of 19 ga. cable is recommended. The limiting loop resistance for this type of cable is 2000 w. (magneto operation) with regard to supervision and signalling and 30 db the limit of intelligibility for speech. It will be noted that the resistance of 19 gauge non-loaded cable is 86 ohms per loop mile, making the limit of supervision approximately 23 miles. The effective transmission loss per mile of this cable is about 1 db per mile. Thus a limit for speech, using the standards as set out in the notes on policy, is not more than 30 miles of this type of cable. If for any reasons cables of smaller or larger gauge are used, the distance will change in inverse proportion to the change in the gauge of the cable.

4. Since any circuit set up through the switchboard must of necessity comprise two loops, the limiting length of any one loop, using 19 ga. non-loaded cable throughout, to insure good intelligibility should not exceed 15 miles. Thus, in general, the loop loss rather than the supervision limit is the controlling factor in the design of this type of plant. This condition, however, may be modified slightly in cases where one long loop of 20 or 25 miles is required, where it can be determined for certain that the loss of any other loop to which connection need be made within the area, will not exceed the difference between the loss in the long loop and the 30 db specified for total circuit loss.

5. In the case of operational circuits requiring connection beyond the limits outlined as above, reference must be made to the C.S.O. for engineering details with respect to plant design in order to determine the allowable limits for the type of service required.

EFFECTIVE TRANSMISSION RATINGS

Educational Training Material

Sec. 2D P.E.M.134

Basis of rating = Repetition rate per 100 seconds of a "Working Reference System". A "Master Reference System" has not yet been evolved. The db overall rating (18 db) on the old volume basis of this Working Reference System becomes the basic effective rating - i.e. 18 db.

Component parts of the reference cct are rated the same way. All other effects but volume thus obtain a reference zero in the Reference Cct. All other ccts are more or less than 18 db overall rating depending on their relation to this "Working Reference System".

WORKING REFERENCE SYSTEM FOR THE SPECIFICATION OF EFFECTIVE LOSSES

Measurement of other ccts is expressed in terms of change in the reference trunk. Repetition rates obtained with the reference system can be varied by changing the loss of the reference trunk & a change in repetition rates expressed as a change in db from Ref. Sys.

The effective equivalent of a cct can be obtained by determining its repetition rate & adjusting the trunk of the reference system until the same repetition rate is obtained. The effective equivalent of the cct is then 18 db plus or minus the amnt. by which the trunk was changed to reach equality of repetition rates.

CHIEF EFFECTIVE LOSSES ARE AS FOLLOWS:-

Loss	
1. Transmitting Loop Losses)	..... Loop
2. Receiving " ")	
3. Trunk Losses)	
4. Terminal Junction Losses)	..... Trunk
5. Intermediate " ")	
6. Central Office Losses	..... Office
7. Losses due to excess line noise	..... Line
8. Losses due to abnormal room noise	... Subs. Premices.

The complete reference system consists of several groups of curves, one set for each part of the cct - i.e.

Loop Losses
Conn. Cct Losses (Trunk Losses
etc. (Term. Junct. Losses
(Inter. " "

+ correction factors for minor items

DECIBEL - THE NAME FOR THE TRANSMISSION UNIT
By W.H. Martin: in Bell Tech. Journal Jan/29.

1. Two amounts of power differ by one db when they are in the ratio of $(10)^{0.1}$ and by N db when their ratio is $(10)^{N(0.1)}$

2. The number of transmission units (db) corresponding to the ratio of any two powers is ten times the common logarithm of that ratio.

EFFECTIVE TRANSMISSION RATINGS

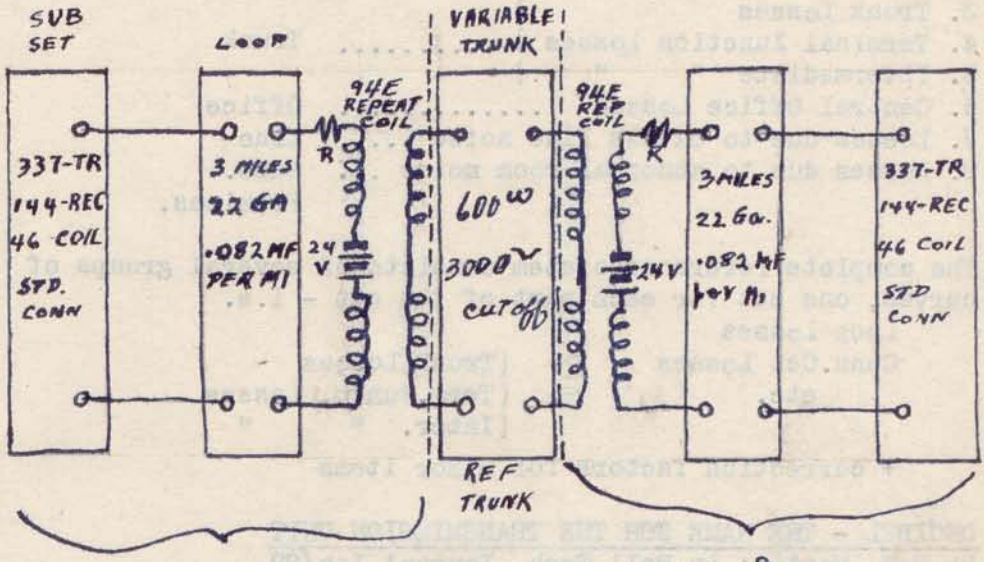
Educational Training Material

Sec. 2D P.E.M.134

Basis of rating = Repetition rate per 100 seconds of a "Working Reference System". A "Master Reference System" has not yet been evolved. The db overall rating (18 db) on the old volume basis of this Working Reference System becomes the basic effective rating - i.e. 18 db.

Component parts of the reference cct are rated the same way. All other effects but volume thus obtain a reference zero in the Reference Cct. All other ccts are more or less than 18 db overall rating depending on their relation to this "Working Reference System".

WORKING REFERENCE SYSTEM FOR THE SPECIFICATION OF ~~SPECIFIC~~ EFFECTIVE LOSSES



Ref. Loop

R = 25 W DC (38 W AC)
allowance for Relays, office Wiring + Heat Coils

Line noise = 100 NV in ea Receiver
Room noise = Typical 1" - Small office of about 4 people, no typewriters or computing machines, fans etc

Measurement of other ccts is expressed in terms of change in the reference trunk. Repetition rates obtained with the reference system can be varied by changing the loss of the reference trunk & a change in repetition rates expressed as a change in db from Ref. Sys.

The effective equivalent of a cct can be obtained by determining its repetition rate & adjusting the trunk of the reference system until the same repetition rate is obtained. The effective equivalent of the cct is then 18 db plus or minus the amnt. by which the trunk was changed to reach equality of repetition rates.

CHIEF EFFECTIVE LOSSES ARE AS FOLLOWS:-

Loss	Element
1. Transmitting Loop Losses)	
2. Receiving " ")	Loop
3. Trunk Losses)	
4. Terminal Junction Losses)	Trunk
5. Intermediate " ")	
6. Central Office Losses	Office
7. Losses due to excess line noise	Line
8. Losses due to abnormal room noise ...	Subs. Premices.

The complete reference system consists of several groups of curves, one set for each part of the cct - i.e.

Loop Losses
Conn.Cct Losses (Trunk Losses
etc. (Term.Junct. Losses
(Inter. " "

+ correction factors for minor items

DECIBEL - THE NAME FOR THE TRANSMISSION UNIT
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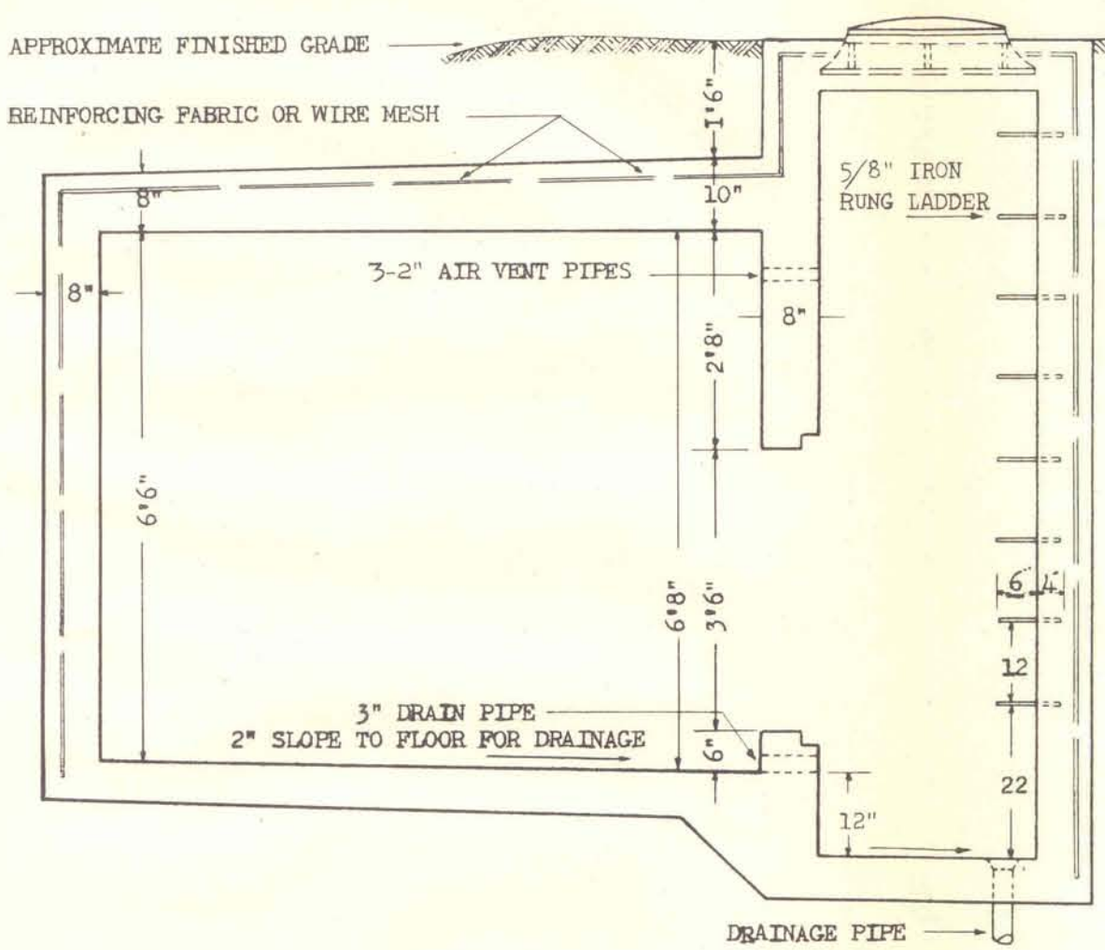
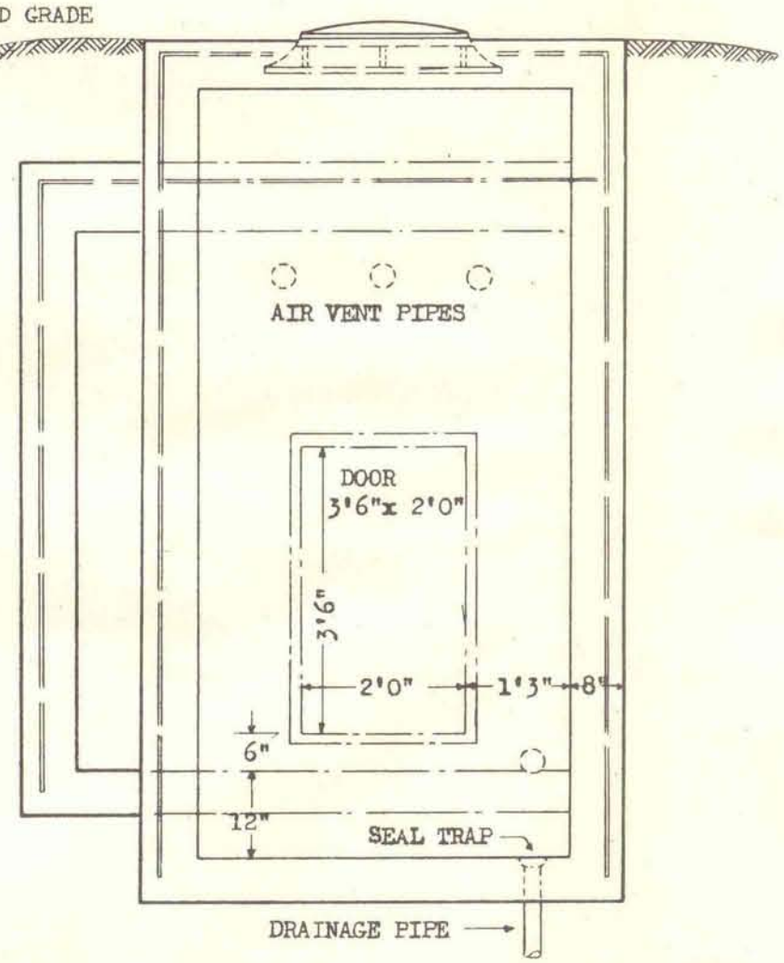
2. The number of transmission units (db) corresponding to the ratio of any two powers is ten times the common logarithm of that ratio.

APPENDIX "G"

1. Fixed Signal Services Test Pit Details.

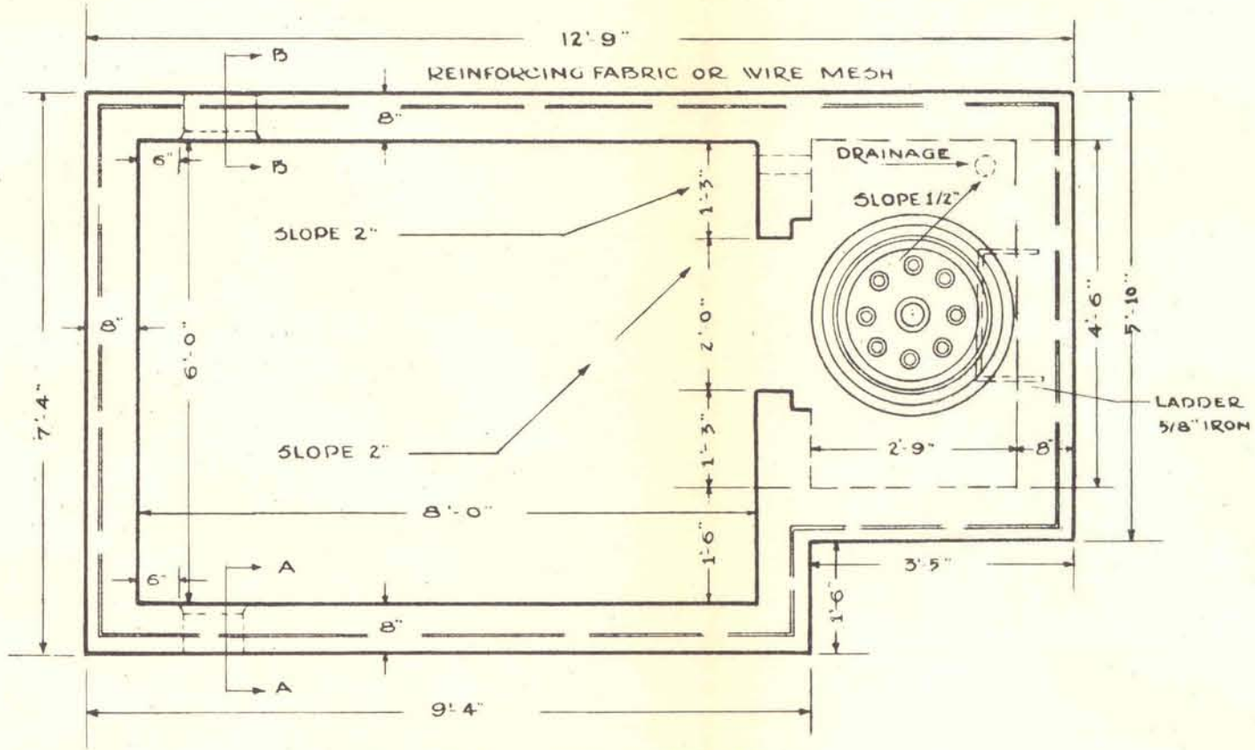


SIDE ELEVATION

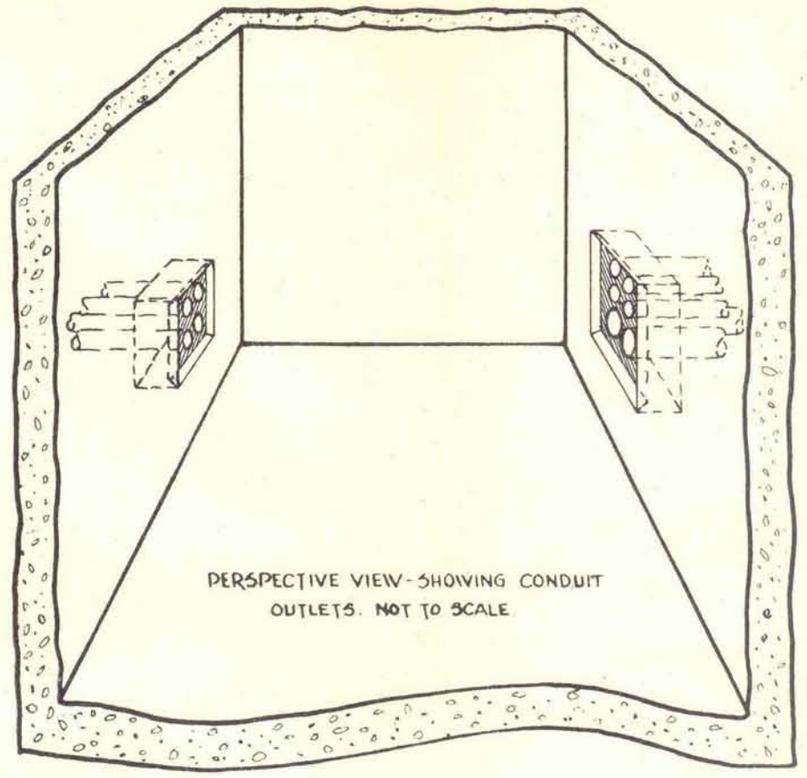


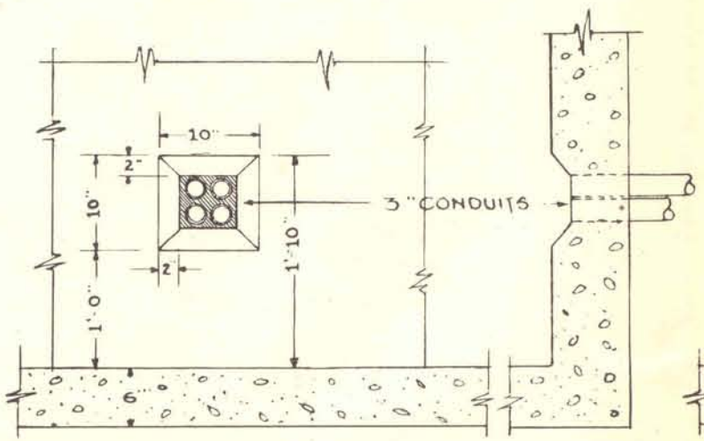
FRONT ELEVATION

DIRECTORATE OF SIGNALS "ARMY" OTTAWA - CANADA	
TEST PIT DETAILS	
DATE: 3-MAY-44	CHECK:
SCALE: 1/2"=1'-0"	APPROVE:
DRW'G: [illegible]	SECTION: SIGS. 2
TRC'G: [illegible]	DWG. NO. E-1-147

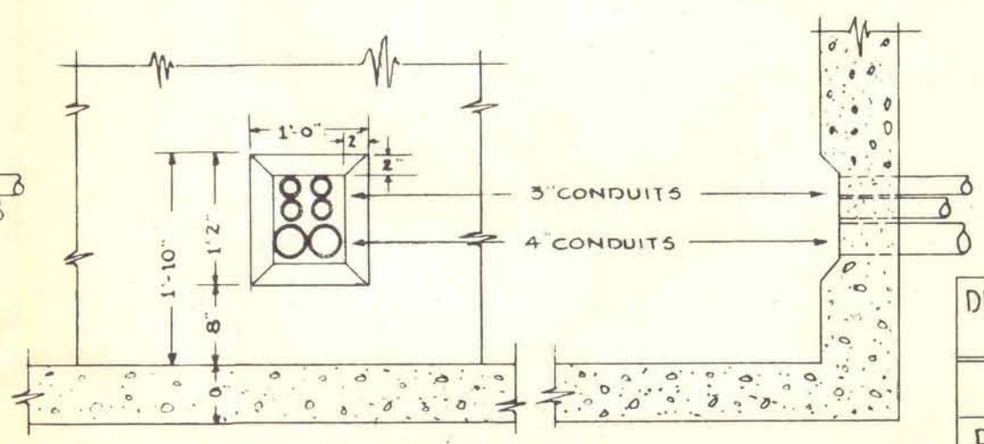


FLOOR PLAN & COVER ARRANGEMENT.
SCALE: 1/2"=1'-0"





FRONT ELEVATION & THRU SECTION
SECTION A-A
SCALE: 3/4"=1'-0"



ELEVATION & THRU SECTION
SECTION B-B
SCALE: 3/4"=1'-0"

DIRECTORATE OF SIGNALS ARMY OTTAWA - CANADA	
TEST PIT DETAILS	
DATE: 3-MAY-44	CHECK
SCALE: AS SHOWN	APPROVE
DWG: [illegible]	SECTION - SIGS. 2
TRC'G: [illegible]	DWG. NO: E-1-148

APPENDIX "H"

1. Pole Line and Associated Hardware.
2. Cable Splicing Material.
3. Cable.
4. Terminals, Binding Post Chambers, Fuse Chambers, etc.
5. Protectors Racking and Associated Material.
6. Drop and Inside Wiring Materials.
7. Material Inventory List.
8. Mechanical and Electrical Characteristics of Open Wire and Cable.

PRELIMINARY ESTIMATE

Estimate No. .....

Pole Line, and Associated Hardware

Project .....

QUANTITY PER MILE	QUANTITY	ITEM	SIZES AND TYPES	CAT. NO.	USE	UNIT	PRICE PER UNIT	AMT.
		Anchors, Hammer Drive	¼" x 1"		For attaching cable clamps and straps to masonry and brick	C	$ 5.00	
		Anchors, Hammer Drive	$\frac{5}{16}$" x 1¼"		For terminals on walls	C	6.00	
		Anchors, Hammer Drive	$\frac{5}{16}$" x 2¼"		Heavier terminals	C	8.00	
		Anchors, Hammer Drive	⅓" x 3½"		Cable racks	C	15.00	
		Anchors, Rock, Guy	⅜" x 8"	22028	Anchoring guys to rock	C	54.00	
		Anchor, Rock, Guy	1" x 12"	22020	Anchoring guys to rock	C	105.00	
		Arm Extension, Cable, Slater	44½" offset	8921	Cable extension from pole (2½' long)	ea.	9.90	
		Brace, Diagonal	83"	8050	Attaching extension arms to poles	C	236.00	
		Bolts, Carriage	⅜" x 4½"	9634½	Attaching crossarm braces to crossarms	C	2.95	
		Bolts, Double Arming	⅝" x 16"	9866	O.W.—corners and deadening. To mount suspension clamps for two cables.	C	25.00	
		Bolts, Double Arming	⅝" x 18"	9868	O.W.—corners and deadening. To mount suspension clamps for two cables.	C	26.50	
		Bolts, Machine	⅜" x 4½"	9604½	Attaching two braces to crossarms	C	2.80	
		Bolts, Machine	½" x 4½"	9704½	Diagonal braces—one used each arm	C	5.00	
		Bolts, Machine	⅝" x 6"	9806	For steel extension arm	C	9.75	
		Bolts, Machine	⅝" x 10"	9810	Fastening suspension clamps, extension arms and crossarms to poles	C	13.10	
		Bolts, Machine	⅝" x 12"	9812	Fastening suspension clamps, extension arms and crossarms to poles	C	14.90	
		Bolts, Machine	⅝" x 14"	9814	Fastening suspension clamps, extension arms and crossarms to poles	C	16.60	
		Bolts, Machine	⅝" x 16"	9816	Fastening suspension clamps, extension arms and crossarms to poles	C	18.15	
		Bolts, Thimble Eye, straight	⅝" x 10"	9060	Deadending strand	C	34.00	
		Bolts, Thimble Eye, straight	⅝" x 12"	9062	Deadending strand	C	36.20	
		Bolts, Thimble Eye, straight	⅝" x 14"	9064	Deadending strand	C	40.00	
		Bolts, Thimble Eye, angle	⅝" x 10"	9151	For attaching down guy	C	39.50	
		Bolts, Thimble Eye, angle	⅝" x 12"	9152	For attaching down guy	C	42.00	
		Bolts, Thimble Eye, angle	⅝" x 14"	9153	For attaching down guy	C	44.25	
		Brace, crossarm	30" x 1¼" x ¼"	8130	Supporting crossarm, 10-pin	C	21.10	
		Brace, crossarm	20" x 1¼" x ¼"	8120	Supporting 4- and 6-pin crossarms	C	13.90	
		Bracket, transposition, 1-point, complete with bolt, screw and pin		9251	For side circuits	C	69.50	
		Bracket, transposition, Phantom, with U-Bolt and 3 pins		9275	For phantom circuits	C	215.00	
		Bracket, Wooden Pole	1⅝" x 2" x 12" oak	.....		C	6.00	
		Clamps, Cable	No. 11, .75" opening	.....	Attaching cable to poles, walls, etc. (takes 1 anchor H.D., ¼" x 1")	C	1.00	
		Clamps, Cable	No. 21, 1.44" opening	.....		C	3.25	
		Clamps, Cable	No. 42, 2.87" opening	.....		C	8.25	
		Clamps, Grade, Adjustable	Type "B"	.....	Clamping cables from 1½" to $1\frac{3}{16}$" diameter to 6,000 and 10,000 lb. strand	C	50.00	
		Clamps, Guy, 3-bolt	6"	7450		C	26.80	
		Clamps, Span	.....	8917	For making drop wire attachments to strand	C	22.70	
		Connectors, Strand	.....	8913	Connecting up dead-ends of messenger strand between poles	C	34.00	
		Crossarms, 6-pin	6 ft.	5		ea.	1.50	
		Crossarms, 10-pin	10 ft., type "A"	10	Normal construction, other than joint use	ea.	2.50	
		Crossarms, 10-pin	10 ft., type "B"	.....	On jointly used poles	ea.	2.50	
		Guard, Guy, Universal	8'	7558		ea.	2.18	
		Guard, U-Cable	8' x $2\frac{3}{16}$"	7533	For protecting cables on poles or bldgs.	ea.	1.81	
		Guy, Nut	.....	22115	For guy or messenger with straight or angle pull	C	28.30	
		Hangers, Messenger, 3-bolt	5⅜" long	8903	For suspending strand from poles	C	42.25	
		Houseline, (Marlin)	5 lb. Balls	.....		C lb.	85.00	
		Hook, Guy	.....	7584	For securing wrapped guys to poles	M	10.25	
		Insulators, Glass, pony	No. 9 pony	.....	Short local O.W. lines	M	72.00	
		Insulators, Glass, toll line	No. 16	16	Long toll lines	M	91.00	
		Insulators, Porcelain Strain	.....	502	For use in insulating sections of strand	C	26.50	
		Insulators, Glass, one piece, transposition	.....	53	For transposing on crossarms (requires 1 wood transposition pin)	C	33.75	
		Links, Reinforcing, Type L	8⅜"	8929	To relieve side strain on strand at angles in line. Attach with ½" x 4½" lag screw	C	37.00	
		Nails, Wire, Galv.	2" 6 D	.....	For strainplates	C lbs.	10.00	
		Nails, Wire, Galv.	4½" 30D	.....	For thin section of sideblock	C lbs.	10.00	
		Nails, Wire, Galv.	6" 60D	.....	For thick section of sideblock	C lbs.	10.00	
		Nuts, Thimble Eye	For ⅝" bolt	7660	Used with angleye bolt for deadending	C	58.50	
		Pins, short shank (transp'n bkts.)	4¼" x ½"	8010	Used with steel crossarms and transposition brackets	C	15.00	
		Pins, Crossarm, wood, standard	1¼" x 8"	.....	Used with wood crossarms	C	3.00	
		Pins, Crossarm, wood transposition	1¼" x 9"	.....	Used with wood crossarms and one piece glass transposition insulators	M	41.00	
		Plates, Guy, curved	.....	8887	For angle thimbleye bolt when guy wire is subject to heavy strains. Takes two ½" x 4½" lag screws	C	24.00	
		Plates, Guy, flat	.....	8891	Takes two ½" x 4½" lag screws	C	28.50	
		Plates, Strain	.....	7575	For deadending guys or messenger	C	12.90	
		Poles, Eastern Cedar	35' Cl. 5	.....	865 lbs. ea., 55 per carload, 19" circ.	ea.	.....	
		Poles, Eastern Cedar	30" Cl. 5	.....	662 lbs. ea., 71 per carload, 19" circ.	ea.	.....	

5 pads of 100—8-43 (1571)
H.Q. 1772-60-1
K.P. 88104

19 Aug., 1943
Office of Director of Signals.

PRELIMINARY ESTIMATE

Estimate No. .....

Project .....

Pole Line, Open Wire, and Associated Hardware

QUANTITY PER MILE	QUANTITY	ITEM	SIZES AND TYPES	CAT. No.	USE	UNIT	PRICE PER UNIT	AMT.
		Poles, Eastern Cedar	25′ Cl. 5	.....	508 lbs. ea., 93 per carload, 19″ circ.	ea.	.....	
		Poles, Eastern Cedar	35′ Cl. 6	.....	733 lbs. ea., 65 per carload, 17″ circ.	ea.	.....	
		Poles, Eastern Cedar	30′ Cl. 6	.....	573 lbs. ea., 84 per carload, 17″ circ.	ea.	.....	
		Poles, Eastern Cedar	25′ Cl. 5	.....	423 lbs. ea., 113 per carload, 17″ circ.	ea.	.....	
		Poles, Eastern Cedar	22′ Cl. 5	.....	.....	ea.	.....	
		Reels and Lagging	.....	.....	.....	ea.	.....	
		Rings, Bridle	Type E $\frac{3}{8}$″ x 1″	2154	For feeding drop to open wire	C	$ 1.30	
		Rings, Bridle	Type C 1¼″ x 1$\frac{7}{16}$″	2156	For feeding drops into terminals	C	3.55	
		Rings, Cable	1½″ for $\frac{5}{16}$″ diam. strand	2161½	Used to support 26, 51 or 101 pr. B.S.A. Cable; 26 or 51 pr. C.N.B. Cable;	C	2.10	
		Rings, Cable	1½″ for $\frac{3}{32}$″ diam. strand	2161½	26 pr. D.N.B. Cable.	C	2.10	
		Rings, Cable	2″ for $\frac{5}{16}$″ diam. strand	2162		C	2.55	
		Rings, Cable	2″ for $\frac{3}{32}$″ diam. strand	2162	Used to support 101 pr. C.N.B. or 51 pr. D.N.B. Cables.	C	2.55	
		Rings, Cable, Extra Long	1½″ for $\frac{5}{16}$″ diam. strand	2181½		C	5.20	
		Rings, Cable, Extra Long	1½″ for $\frac{3}{32}$″ diam. strand	2181½	Used to suspend a second cable below the original on an existing strand	C	5.20	
		Rods, Anchor, Thimble Eye	½″ x 7′	8507	.....	C	65.00	
		Rods, Anchor, Thimble Eye	⅞″ x 6′	8516	For Pole Line Guying	C	84.00	
		Rods, Anchor, Thimble Eye	⅞″ x 8′	8518	.....	C	103.00	
		Rods, Ground, with Copper Wire	½″ x 5′	9505	Used for Station Ground	C	62.00	
		Screws, Lag	⅜″ x 3″	9743	Type No. 9202 Bracket to Pole	C	2.30	
		Screws, Lag	¼″ x 2½″	9722½	Terminals on Wood	C	1.55	
		Screws, Lag	½″ x 4½″	9754½	Crossarm Braces and Steel Extension Arm, 2 per Arm	C	4.85	
		Screws, Lag	½″ x 6½″	9756½	Diagonal Brace, 1 used	C	6.50	
		Screws, Lag	⅜″ x 4″	9744	Lower Bracket on BD to Pole, Type No. 9202 Bracket to Pole	C	2.70	
		Servi Sleeves	$\frac{5}{16}$″	7453	Serving Messenger and Guy Wire	C	2.65	
		Servi Sleeves	9/32″	7457	Serving Messenger and Guy Wire	C	2.65	
		Steps, Pole, Steel, std.	.....	7125	.....	C	13.60	
		Steps, Pole, Wood	Plain Oak	.....	For Lower Steps on Pole	C	2.89	
		Strand, 7/12 Zinctite, hard grade	$\frac{5}{16}$″ diam.	.....	222 Lbs. per M Ft., Breaking Weight 6,010 Lbs.	C Lbs.	10.40	
		Straps, Cable, U-guard	.....	7539	For Fastening Cable U-guards to Poles, etc.	C	10.00	
		Straps, Cable, Slater	1$\frac{1}{16}$″	2144	Attaching Cable to Poles or Buildings	C	3.25	
		Straps, Guy, Storm	.....	6001	Takes two ½″ Lag Screws	C	24.90	
		Straps, Thimble, Eye, Wall	.....	8895	For Attaching Strand to Wall	C	45.75	
		Straps, Wall, Loop	.....	8892	For Attaching Strand to Wall	C	28.20	
		Supporters, Cable, Slater	No. 1	22121	Max. Diameter of Cable or Sleeve ¾″	C	4.00	
		Supporters, Cable, Slater	No. 2	22122	Max. Diameter of Cable or Sleeve 1$\frac{3}{16}$″	C	4.80	
		Supporters, Cable, Slater	No. 4	22124	Max. Diameter of Cable or Sleeve 2⅛″	C	6.90	
		Thimble Eye, Guy, Slater	.....	1100	Used for Down Guy	C	48.50	
		Washers, Curved, Galv.	3¼″ x 3⅛″ x ¼″	7825	Dead-ending, Using Thimble Eye. .75 Lbs. each	C	11.85	
		Washers, Square, Galv.	4″ x 4″ x $\frac{3}{16}$″	7818	.83 Lbs. each—for Thimble Eye Anchor Rods	C Lbs.	10.75	
		Washers, Square, Galv.	2¼″ x 2¼″ x $\frac{3}{16}$″	7814	.26 Lbs. each—for Through Bolts	C Lbs.	10.75	
		Washers, Round, Galv.	1″ x $\frac{7}{16}$″	7801	2 used with Crossarm Braces. .16 Lbs. each	C Lbs.	15.30	
					Lbs. per Mi. / Resist. per Mi. / Break Load / DB Loss per Mi.			
		Wire, Copper	HD No. 12 NBS .104″ dia.	.....	172 / 5.06 ohms / 550 lbs. / .066	C Lbs.	19.05	
		Wire, Copper	HD No. 10 NBS .128″ dia.	.....	261 / 3.34 ohms / 830 lbs. / .046	C Lbs.	18.45	
		Wire, Copper	HD No. 8 BWG .165″ dia.	.....	435 / 2.01 ohms / 1326 lbs. / .030	C Lbs.	18.45	
		Wire, Copper, Tie	.104″ diameter	.....	22″ (16 Ties per lb.)	C Lbs.	19.05	
		Wire, Copper, Tie	.128″ diameter	.....	22″ (10 Ties per lb.)	C Lbs.	18.45	
					Lbs. per Mi. / Resist. per Mi. / Break Load / DB Loss per Mi.			
		Wire, Steel, Zinctite	No. 12 BWG 109 mil. gd. 60A	.....	170 / 34.12 ohms / 475 lbs. / .30	C Lbs.	6.03	
		Wire, Steel, Zinctite	No. 12 BWG 109 mil. gd. 85A	.....	170 / 34.12 ohms / 793 lbs. / .30	C Lbs.	6.03	
		Wire, Ground	No. 6 R.C.D.B.	.....	..... / ..... / ..... /	M Ft.	40.00	
		Wire, Ground, Substation	No. 14	.....	..... / ..... / ..... /	M ft.	10.20	

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H.Q. 1772-60-1
K.P. 88104

19 Aug., 1943
Office of Director of Signals.

PRELIMINARY ESTIMATE

Estimate No. .....

Cable Splicing Material, etc.

Project .....

QUANTITY PER MILE	QUANTITY	ITEM	SIZES AND TYPES	CAT. NO.	USE	UNIT	PRICE PER UNIT	AMT.
		Compound, Sealing	½ gal. cans	No. 23	For filling insulated joints, etc. (5 lbs. per ½ gal. can)	can	$ .85	
		Compound, Pothead	1-5 gal. cans (50 lbs.)	No. 30	For power cable work	gal.	1.75	
		Form, Cable, Soldering	⅞" (pkg.-6)	.....	Attaching bonding ribbon to cable sheath or sleeve	ea.	.18	
		Houseline, Marlin	.....	.....	Various uses in cable construction	lb.	.....	
		Muslin	2"	.....	Wrapping cable splices	roll	.50	
		Muslin	4"	.....	Wrapping cable splices	roll	1.00	
		Nails, Strap, Galv.	62 per lb.	.....	For cable clamps on wood	lb.	.10	
		Paraffin Wax		.....	Boiling out splices, etc.	C lbs.	11.00	
		Pasters, Paper	2" x 17"	.....	For limiting width of wiped joints	M	5.50	
		Ribbon, Bonding, Plain	⅞"-17 ft. per lb.	.....	For bonding cable to cable or cable to strand	lb.	.35	
		Sleeves, Nicopress	1-102-C	.....	104 mil. copper line wire	C	5.25	
		Sleeves, Nicopress	1-128-E	.....	128 mil. copper line wire	C	7.70	
		Sleeves, Nicopress	4-109-C	.....	60 grade steel wire	C	6.00	
		Sleeves, Nicopress	5-109-D85	.....	85 grade high strength steel wire	C	7.05	
		Sleeves, Nicopress	3-045-B	.....	CS drop wire, 17 ga.	C	2.05	
		Sleeves, Nicopress	5-109-D135	.....	135 grade high strength steel wire	C	10.05	
		Sleeves, Nicopress	3-051-B	.....	HC drop wire, 16 ga.	C	2.05	
		Sleeves, Nicopress	3-025-A	.....	22 ga. inside and duct wire	C	2.05	
		Sleeves, Lead Antimony	1" x 15" (2.32 lb.)	.....	6-11-16-26-19 ga. straight splices	C lbs.	10.25	
		Sleeves, Lead Antimony	1½" x 15" (3.38 lb.)	.....	51 pr., 19 ga., straight splices	C lbs.	10.25	
		Sleeves, Lead Antimony	1¾" x 17" (4.42 lb.)	.....	26 pr., 19 ga., straight splices (26 pr. to 26 pr. branch)	C lbs.	10.25	
		Sleeves, Lead Antimony	2" x 17" (5.02 lb.)	.....	101 pr., 19 ga., straight splices (51 pr. to 26 or 51 pr. branch)	C lbs.	10.25	
		Sleeves, Lead Antimony	2¾" x 20" (8.01 lb.)	.....	202 pr., 19 ga., straight splices	C lbs.	10.25	
		Sleeves, Cotton, Prepared	5/32" (400/carton)	order	22 ga. straight, bridge or butt joint. 19 ga. straight or butt	carton	1.00	
		Sleeves, Cotton, Prepared	¼" (200/carton)	by	19 ga. bridge or 16 ga. straight, bridge or butt joint	carton	1.00	
		Sleeves, Cotton, Prepared (double wall)	5/32" (300/carton)	carton	19 ga. toll conductors or submarine cable soldered joint	carton	1.50	
		Sleeves, Cotton, Prepared (double wall)	¼" (150/carton)		16 ga. toll conductors or submarine cable soldered joint	carton	1.50	
		Sleeves, Tinned Copper (double tube)	100/box	No. 16	16 ga. straight for submarine cables	C	5.00	
		Solder	38-62	.....	Seams in lead sleeves	lb.	.40	
		Solder, Wiping	T.B.L.	.....	For wiping joints	C lbs.	66.00	
		Solder, Resin Core	5 lb. spool	.....	Joints in cable conductors	lb.	.35	
		Spun Yarn	3 yarn tarred marlin	.....		lb.	1.10	
		Stearine, Sticks	8 sticks per lb.	.....	Used in soldering to prevent oxidation	ea. stick	.08	
		Straps, Adjustable, Sleeve	.....	.....	For supporting large sleeves	.....	.....	
		Tags, Cable	.....	.....		.....	.....	
		Tape, Cotton (Med. Stay Binding Tape)	¾"	.....	Protecting core of cable from edge of sheath	roll	.60	
		Tape, Friction	¾"	.....		lb.	.35	
		Tape, Rubber (Splicing Compound)	¾"	.....		lb.	.42	
		Wire, 109 Galv.	171 lbs. per M ft.	.....	Submarine cable lashing	C lb.	7.00	
		Wire, Lashing	125' per lb.	.....	General use	C lb.	12.00	

5 pads of 100—8-43 (1571)
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K.P. 88104

19 Aug., 1943
Office of Director of Signals.

PRELIMINARY ESTIMATE

Estimate No. .....

Project .....

Cable

QUANTITY	ITEM	GAUGE AND TYPE	OUTSIDE DIAM. (in.)	WT. PER FOOT (lbs.)	SHEATH THICKNESS (in.)	D.C. RES. PER LOOP MI. (ohms)	ATTENUATION PER MILE UNLOADED (db)	H. 88 Ldg. (db)	H. 135 Ldg. (db)	MAX. REEL LENGTH (ft.)	UNIT	PRICE PER UNIT	AMT.
	Cable, C.N.B., 16 pr.	19 ga. P.I.L.C.	.60	.70	.067	85	1.26	.42	.34	3600	M ft.	$ 98.00	
	Cable, C.N.B., 26 pr.	19 ga. P.I.L.C.	.72	.93	.070	85	1.26	.42	.34	3100	M ft.	136.00	
	Cable, C.N.B., 51 pr.	19 ga. P.I.L.C.	.95	1.46	.075	85	1.26	.42	.34	2500	M ft.	229.00	
	Cable, C.N.B., 101 pr.	19 ga. P.I.L.C.	1.29	2.46	.084	85	1.26	.42	.34	1900	M ft.	417.00	
	Cable, D.N.B., 16 pr.	19 ga. P.I.L.C.	.68	.81	.069	85	1.11	.38	.30	3000	M ft.	113.00	
	Cable, D.N.B., 26 pr.	19 ga. P.I.L.C.	.83	1.10	.073	85	1.11	.38	.30	2600	M ft.	161.00	
	Cable, D.N.B., 51 pr.	19 ga. P.I.L.C.	1.10	1.71	.079	85	1.11	.38	.30	1800	M ft.	267.00	
	Cable, D.N.B., 101 pr.	19 ga. P.I.L.C.	1.49	2.84	.088	85	1.11	.38	.30	1700	M ft.	477.00	
	Cable, B.S.A., 16 pr.	22 ga. P.I.L.C.	.47	.48	.064	171	1.79	.79	.63	4400	M ft.	66.00	
	Cable, B.S.A., 26 pr.	22 ga. P.I.L.C.	.57	.63	.066	171	1.79	.79	.63	4400	M ft.	92.00	
	Cable, B.S.A., 51 pr.	22 ga. P.I.L.C.	.73	.95	.070	171	1.79	.79	.63	3500	M ft.	151.00	
	Cable, B.S.A., 101 pr.	22 ga. P.I.L.C.	.98	1.51	.076	171	1.79	.79	.63	3100	M ft.	261.00	
	Cable, N.J.R., 2 pr.	22 ga. R.I.L.C.	.50	.30		195	2.21	1.20	.93	2000	M ft.	71.00	
	Cable, N.T.R., 2 pr.	22 ga. R.I.L.C.	.71	.55		195	2.21	1.20	.95	1000	M ft.	116.00	
			Wt. Per	Outside Diameter									
			Foot	Overall	L. Sheath								
	Cable, D.N.B., J.P., 16 pr.	Jute Protected	.90	.95	.66	85	1.11	.38	.30	1500	M ft.	148.00	
	Cable, D.N.B., J.P., 26 pr.	Jute Protected	1.20	1.10	.83	85	1.11	.38	.30	1500	M ft.	235.00	
	Cable, D.N.B., J.P., 51 pr.	Jute Protected	2.05	1.41	1.10	85	1.11	.38	.30	2000	M ft.	349.00	
	Cable, D.N.B., J.P., 101 pr.	Jute Protected	3.45	1.82	1.49	85	1.11	.38	.30	2000	M ft.	622.00	
	Cable, D.N.B., D.W.A., 7 pr.	Double Wire Arm'd	3.5	1.5	.54	85	1.11	.38	.30		M ft.	475.00	
	Cable, D.N.B., D.W.A., 12 pr.	Double Wire Arm'd	4.0	1.6	.65	85	1.11	.38	.30		M ft.	540.00	
	Cable, D.N.B., D.W.A., 17 pr.	Double Wire Arm'd	4.7	1.7	.73	85	1.11	.38	.30		M ft.	593.00	
	Cable, D.N.B., D.W.A., 27 pr.	Double Wire Arm'd	5.2	1.9	.88	85	1.11	.38	.30		M ft.	690.00	
	Cable, D.N.B., D.W.A., 52 pr.	Double Wire Arm'd	7.1	2.2	1.15	85	1.11	.38	.30		M ft.	979.00	
	Cable, D.N.B., D.W.A., 102 pr.	Double Wire Arm'd	10.4	2.7	1.54	85	1.11	.38	.30		M ft.	1375.00	
	Cable, A.S.M., 26 pr.	24 ga. P.I.L.C.	.52	.51						4200	M ft.	76.00	
	Cable, A.S.M., 51 pr.	24 ga. P.I.L.C.	.74	.64	Used for protection where required					4000	M ft.	119.00	
	Cable, A.S.M., 101 pr.	24 ga. P.I.L.C.	1.17	.85						3100	M ft.	202.00	
	Cable, B.U.A., 11 pr.	22 ga. Double Cotton Ins.	.41	.30						3500	M ft.	107.00	
	Cable, B.U.A., 16 pr.	22 ga. Double Cotton Ins.	.47	.38						3500	M ft.	144.00	
	Cable, B.U.A., 26 pr.	22 ga. Double Cotton Ins.	.57	.53	Used in terminating paper insulated cable in buildings where					3500	M ft.	207.00	
	Cable, B.U.A., 51 pr.	22 ga. Double Cotton Ins.	.75	.86	boiling out compounds are not to be used.					3500	M ft.	437.00	
	Cable, B.U.A., 101 pr.	22 ga. Double Cotton Ins.	1.01	1.45						2000	M ft.	1250.00	

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PRELIMINARY ESTIMATE

Estimate No. .....

Project .....

Terminals, Binding Post Chambers, Fuse Chambers, Etc.

QUANTITY	ITEM	SIZES AND TYPES	USE	UNIT	PRICE PER UNIT	AMT.
	Adapters	102B $9\frac{1}{16}$" x $2\frac{3}{32}$"	For 31B Blocks in GA.11, GB.11, GC.32 Terminal Box	ea.	$ .72	
	Adapters	102C $12\frac{1}{16}$" x $2\frac{3}{32}$"	For 31C Blocks in GA.16, GB.16, GC.32, GC.52 Terminal Box	ea.	.79	
	Adapters	102D $19\frac{1}{16}$" x $2\frac{3}{32}$"	For 31D Blocks in GA.26, GB.26, GC.52, GC.102 Terminal Box	ea.	.98	
	Backboards	83A	Used in L16 Cab. Term. Secs. Supports 2-G16 B.P. Chambers or 3-30C Conn. Blocks and 3-102C Adapters	.....	.....	
	Backboards	83B	Used in L26 Cab. Term. Secs. Supports 2-G51 B.P. Chambers or 3-30D Conn. Blocks and 3-102D Adapters	.....	.....	
	Backboards	83C	Used in L51 Cab. Term. Secs. Supports 1-H101 and 1-G26 B.P. Chambers or 6-30D Conn. Blocks and 6-102D Adapters	.....	.....	
	Backboards	84A	Used in LA26 Cab. Term. Secs. Supports 2-G (or H) 51 B.P. Chambers or 4-30D Conn. Blocks and 3-102D Adapters	.....	.....	
	Backboards	84B	Used in LA51 Cab. Term. Secs. Supports 2-H101 B.P. Chambers or 8-30D Conn. Blocks and 8-102D Adapters	.....	.....	
	Blocks, Connecting	30A, 6 Pr.	With Locknuts	ea.	.75	
	Blocks, Connecting	31A, 6 Pr.	With Soldering Lugs	ea.	.79	
	Blocks, Connecting	30B, 11 Pr., $7\frac{5}{16}$" x 1½"	With Locknuts	ea.	1.20	
	Blocks, Connecting	31B, 11 Pr.	With Soldering Lugs	ea.	1.29	
	Blocks, Connecting	31C, 16 Pr., $10\frac{7}{16}$" x 1½"	With Soldering Lugs	ea.	1.80	
	Blocks, Connecting	30C, 16 Pr.	With Locknuts	ea.	1.64	
	Blocks, Connecting	30D, 26 Pr.	With Locknuts	ea.	2.69	
	Blocks, Connecting	31D, 26 Pr., $16\frac{1}{16}$" x 1½"	With Soldering Lugs	ea.	2.87	
	Boxes, Cable Terminal, Inside Service	GA11, $10\frac{3}{16}$" x 4⅛"	Arranged for 1 G.11 Binding Post Chamber or 1 No. 102B Adapter	ea.	1.62	
	Boxes, Cable Terminal, Inside Service	GA16, $13\frac{5}{16}$" x 4⅛"	Arranged for 1 G.16 Binding Post Chamber or 1 No. 102C Adapter	ea.	1.72	
	Boxes, Cable Terminal, Inside Service	GA26, $19\frac{5}{16}$" x 4⅛"	Arranged for 1 G.26 Binding Post Chamber or 1 No. 102D Adapter	ea.	2.07	
	Boxes, Cable Terminal, Inside Service	GC.52, $21\frac{7}{16}$" x $8\frac{5}{16}$"	Arranged for 2 G.16 or G.26 B.P.Cs. or 2 No. 102C or D Adapter	ea.	2.93	
	Boxes, Cable Terminal, Inside Service	GC.32, $15\frac{7}{16}$" x 8½"	Arranged for 2 G.11 or G.16 B.P.Cs. or 2 No. 102B or C. Adapter	ea.	3.23	
	Boxes, Cable Terminal, Inside Service	GB.11, $10\frac{13}{16}$" x 6⅞"	Arranged for 1 G.11 Binding Post Chamber or 1 No. 102B Adapter	ea.	2.27	
	Boxes, Cable Terminal, Inside Service	GB.16, $13\frac{5}{16}$" x 6⅞"	Arranged for 1 G.16 Binding Post Chamber or 1 No. 102C Adapter	ea.	2.63	
	Boxes, Cable Terminal, Inside Service	GB. 26, $19\frac{5}{16}$" x 7⅞"	Arranged for 1 G.26 Binding Post Chamber or 1 No. 102D Adapter	ea.	3.08	
	Chambers, Binding Post	G11, 6' Stub	Mounts in GA.11, GB.11, GC32 Cable Terminal Box	ea.	4.24	
	Chambers, Binding Post	G16, 6' Stub	Mounts in GA.16, GB.16, GC.32, GC.52 Cable Terminal Box	ea.	5.30	
	Chambers, Binding Post	G26, 6' Stub	Mounts in GA.26, GB.26, GC.52, GC.102 Cable Terminal Box	ea.	7.22	
	Chambers, Binding Post	H51, 6' Stub	2 H51 B.P. Chambers Mount in 1-H102 Cab. Term. Sec.	ea.	14.58	
	Rings, Distributing	8A	Metal Support, used in GA., GB. and GC. Terminals	ea.	.10	
	Strip, Fanning	15A	Used with 30-C or 31-C Connecting Blocks	ea.	.32	
	Strip, Fanning	15B	Used with 30-D or 31-D Connecting Blocks	ea.	.39	
	Terminals, Cable, Outside Service	F.10, 5½' Stub	Paper Insulated Stub	ea.	6.85	
	Terminals, Cable, Outside Service	F.16, 5½' Stub	Paper Insulated Stub	ea.	8.24	
	Terminals, Cable, Outside Service	F.26, 5½' Stub	Paper Insulated Stub	ea.	11.46	
	Terminals, Cable, Outside Service	BD 102 26⅞" x $10\frac{3}{16}$" x 8½"	Paper Insulated Stub	ea.	99.27	
	Terminals, Cable, Outside Service	BD 202, 44½" x $10\frac{3}{16}$" x 8½"	Paper Insulated Stub	ea.	149.83	
		LA 16	Consisting of: 2—L16 Cable Terminal Sections; 2—M16 Cable Terminal Sections; 1—LA16 Fuse Chamber; 1—83A Backboard	ea.	43.10	
	Terminals, Cable, Inside, Protected, Cross Connecting	LA 26	Consisting of: 1—L26 Cable Terminal Sections; 1—LA26 Cable Terminal Sections; 2—M26 Cable Terminal Sections; 1—LA26 Fuse Chamber; 1—84A Backboard. Order following associated equipment separately as required: B.P. Chambers; Connecting Blocks and Adapters	ea.	57.17	
		LA 51	Consisting of: 1—L51 Cable Terminal Sections; 1—LA51 Cable Terminal Sections; 2—M51 Cable Terminal Sections; 1—LA51 Fuse Chamber; 1—84B Backboard. No. 26 and No. 27 Carbons; No. 7A Fuses; No. 60 D Fuses	ea.	90.52	

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PRELIMINARY ESTIMATE

Estimate No. .....

Project .....

Protectors, Racking, and Associated Material

QUANTITY	ITEM	SIZES AND TYPES	USE	UNIT	PRICE PER UNIT	AMT.
	Blocks, Protector	No. 26	For use in No. 64A, 65A and 83A Prot. Mtgs. and 98A Protectors	C	$ 2.34	
	Blocks, Protector	No. 27	For use in 64A, 65A Prot. Mtg. and 98A Prot.	C	6.50	
	Blocks, Protector	No. 30	For use in 83A Protector Mountings	C	10.65	
	Coils, Heat	No. 76A	Used with 1420B and 1425C distributing frames	ea.	.129	
	Frame, Distributing	No. 1420B	125 outside lines, 100 inside lines. Order No. 1435 Prot. Gps. separately	ea.	17.90	
	Frame, Distributing	No. 1425 (Group 1)	Initial equipment consisting of two verticals for first hundred lines. Order No. 1435 prot. groups separately	ea.	41.41	
	Frame, Distributing	No. 1425 (Group 2)	Supplementary equipment consisting of one vertical for each succeeding hundred lines. Order No. 1435 prot. groups separately	ea.	23.58	
	Frame, Distributing	No. 1431A (Group 1)	20 line frame. Order No. 1435 Prot. Gps. separately	ea.	5.05	
	Frame, Distributing	No. 1431A (Group 2)	Supplementary equipment consisting of one detail for each succeeding twenty lines. Order 1435MBP and 1435MP prot. groups separately	ea.	2.62	
	Fuses	7A—7 Amp.	Used with LA Fuse Chambers and 1435U Protector Group	C	19.39	
	Fuses	11C	Used with 98A Protectors	C	13.74	
	Fuses	60D	.350 amps., used with LA Fuse Chambers for sneak current protection	C	40.90	
	Fuses	60E	1.25 amps., used with LA Fuse Chambers (Bty. Feeder ccts.)	C	43.63	
	Groups, Protector	No. 1435R	25 lines—no protection	ea.	3.23	
	Groups, Protector	No. 1435U	For fuse protection (7A) twenty lines. Line side of frame (see 1435MP Group)	ea.	20.20	
	Groups, Protector	No. 1435MBP	20 lines. Heat coils and carbons. Line side of frame. Used with No. 1420B and No. 1431 type frames	ea.	21.49	
	Groups, Protector	No. 1435MP	20 lines. Heat coils and carbons. Switchboard side of frame. Used with No. 1420B and No. 1431 type frames. Always used when No. 1435U group is mounted on same frame	ea.	21.49	
	Hooks, T-Iron	No. 2131, 4"	For racks, cable	C	37.70	
	Hooks, T-Iron	No. 2132, 7½"	For racks, cable	C	61.30	
	Protector, Mounting	No. 65A	20 per strip. To terminate line side of No. 1425 type frames. Order heat coils and carbons separately	ea.	45.00	
	Protector, Mounting	83A	Complete with carbons. For connecting exposed leads into cable. Order carbons separately	ea.	3.84	
	Protectors, Station, complete	98A	For station protection	ea.	1.14	
	Protectors	1093AW	Outside installation of 98A Prot.	ea.	2.20	
	Protectors	D96845	For connecting exposed leads into cable—complete	ea.	15.35	
	Racks, Underground Cable	No. 2125, 24" long, holes spaced at 1½"	For racking cable in manholes or test pits. Order T-iron hooks separately	C	60.00	
	Racking, Cable	5"wide, 9' 8½" lengths, Slater type	Racking cable in buildings	Length	7.97	
	Racking, Cable	12" wide, 9' 8½" lengths, Slater type	Racking cable in buildings	Length	9.39	
	Strips, Terminal	No. 65	For use with 1425 G1 or G2 distributing frame	ea.	2.42	

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PRELIMINARY ESTIMATE

Estimate No. .....

Project .....

Drop and Inside Wiring Materials

QUANTITY	ITEM	SIZES AND TYPES	CAT. NO.	USE	UNIT	PRICE PER UNIT	AMT.
	Blocks, Connecting	2 conductor with cover	11 B	Used in Station Wiring	C	$ 30.00	
	Cable, Inside Wiring	Type B; 24 ga. conductors	.....	Sizes available: 4, 6, 11, 12, 16, 21 and 26 pairs	.....	.....	
	Cable, Switchboard	53 cond.	183 CL	For Switchboard Cabling	Ft.	.20	
	Cable, Switchboard	103 cond.	66 CL	For Switchboard Cabling	Ft.	.36	
	Clamps, Station, Ground	.....	.....	Attaching Gnd. Wire to Pipe	C	6.00	
	Cleats, Wood, Inside Wire	.....	.....	For Clamping Inside Wire	C	.60	
	Nails, Inside Wiring	7/8" brown	.....	Inside Wire to Soft Wood	M	1.90	
	Nails, Inside Wiring	1/2" brown	.....	Inside Wire to Hard Wood	M	1.90	
	Screws, Wood, R.H. Blued	3/4", No. 7	.....	Attaching Wood Cleats	gr.	1.35	
	Screws, Wood, R.H. Blued	1 1/4", No. 8	.....	Station Protectors to Walls	gr.	1.40	
	Screws, Wood, R.H. Blued	2 1/2", No. 8	.....	Sub Sets to Walls	gr.	1.50	
	Staples, No. 3 Insulated			Attaching Single or 2-Condr. Wire to Wood	M	1.55	
	Wire, Inside, 2 Conductor	22 ga. brown	.....	Inside Station Wiring—dry locations	M ft.	8.80	
	Wire Duct, 2 Conductor	22 ga.	.....	Inside Station Wiring—damp locations	M ft.	9.25	
	Wire, Ground	14 ga.	.....	Station Protector Gnd. Connection	M ft.	10.50	
	Bolts, Machine, Galv.	3/8" x 3 1/2"	9603 1/2	Attaching 4-Groove Knobs to Pole or Corner Brackets	C	2.50	
	Bolts, Machine, Galv.	3/8" x 3"	9603	Attaching 4-Groove Knobs to Pole or Corner Brackets	C	2.25	
	Bolts, Machine, Galv.	3/8" x 5 1/2"	9605 1/2	Attaching two 4-Groove Knobs to Pole or Corner Brackets	C	3.30	
	Bolts, Stove, F.H., Galv.	5/16" x 2"	9232	Attaching 2-Groove Knobs to Pole or Corner Brackets	C	2.90	
	Bolts, Stove, F.H., Galv.	5/16" x 3 1/2"	9233 1/2	Attaching two 2-Groove Knobs to Pole or Corner Brackets	C	3.90	
	Brackets, Corner	.....	9204	Mounting Porcelain Knobs at Building Corners	C	18.30	
	Brackets, Pole	.....	9202	Mounting Porcelain Knobs on Poles and Bldgs. Attach to Poles with 1—3/8" x 4" and 1—3/8" x 3" Lag Screws	C	13.30	
	Clip, Drop Wire	Spec. No. 6296	.....	Supporting Drop Wires on Poles	C	8.50	
	Hooks, Drive	.....	1316	Supporting Drop Wires on Poles	.....	.....	
	Knobs, Porcelain	2-groove	9225	For use with Corner Brackets, Pole Brackets and Angle Screws (2-groove only)	C	5.00	
	Knobs, Porcelain	4-groove	9226	For use with Corner Brackets, Pole Brackets and Angle Screws (2-groove only)	C	8.65	
	Screws, Wood, F.H., Galv.	3", No. 18	.....	2-Groove Knobs to Wood	gr.	2.15	
	Screws, Wood, F.H., Galv.	3 1/2", No. 18	.....	2-Groove Knobs to Stucco Walls	gr.	3.50	
	Screw Eyes, Insulated	1" x 1 1/8"	2220	Drop Wire Runs on Bldgs.	C	6.80	
	Screws, Angle	5/16"	2214	Attaching Drop Wire to Bldgs. Use 2-groove Knob	C	5.25	
	Tubes, Porcelain	5/10" x 6"	.....	Insulating Drop Wires through Walls	C	2.75	
	Wire, Drop, Style HC	2 condr. 16ga.	.....		M ft.	18.50	
	Wire, Drop, Type CS	2 condr. 17ga.	.....	Copperweld	M ft.	15.00	

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19 Aug., 1943
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MATERIAL INVENTORY

Period ending_____

Location_____

Date_____

ITEM	Stock In	Stock Out	Stock End of Period
Adapters, 102B 9 11/16" x 2 23/32"			
Adapters, 102C 12 13/16" x 2 23/32"			
Adapters, 102D 19 1/16" x 2 23/32"			
Anchors, Clinch Bolt 3/8"			
Anchors, Clinch Bolt 5/16"			
Anchors, Clinch Bolt 5/8"			
Anchors, Creosoted Plank			
Anchors, Hammer Drive 1/4" x 1"			
Anchors, Hammer Drive 1/4" x 1 1/4"			
Anchors, Hammer Drive 5/16" x 1 1/4"			
Anchors, Hammer Drive 5/16" x 2 1/4"			
Anchors, Hammer Drive 1/2" x 3 1/2"			
Anchors, Hammer Drive Diamond 1 1/4" x 1"			
Anchors, Lead, Scruin No. 408			
Anchors, Lead, Scruin No. 412			
Anchors, Lead, Scruin No. 417			
Anchors, Rock Guy 5/8" x 8"			
Anchors, Rock Guy 1" x 12"			
Anchors, Rock 18"			
Anchors, Rock 1" x 16"			
Anchors, Rock 1" x 19"			
Annunciators, 6" Drop			
Annunciators, No. 81			
Arms, Extension Cable Type "B" 49"			
Arms, Extension Cable, Slater 44 1/2" offset			
Attachments, Transmitter No. 3A			

ITEM	Stock In	Stock Out	Stock End of Period
Bands, Stubbing No. 1818			
Batteries, 1½ V, Type 4FH			
Batteries, "B" 15 volt			
Batteries, "B" 45 volt			
Batteries, Size "D"			
Batteries, Dry "Y" Mark II			
Batteries, Dry "X" Mark II			
Batteries, Dry "C" 4½ volt			
Batteries, Dry Lamp Electric			
Batteries, Storage 6 volt 140 AH			
Batteries, Wavemeter Crystal Calibrated AB			
Batteries, Wavemeter Crystal Calibrated "C"			
Batteries, No. 6			
Beeswax			
Bells, Edwards			
Bells, Electric D.R. No. 503			
Blocks, Connecting No. 7A			
Blocks, Connecting No. 11B			
Blocks, Connecting 30A. 6 Pr			
Blocks, Connecting 30B. 11 Pr			
Blocks, Connecting 30C. 16 Pr			
Blocks, Connecting 30D. 26 Pr			
Blocks, Connecting 31A. 6 Pr			
Blocks, Connecting 31B			
Blocks, Connecting 31C. 10 7/16" x 1½"			
Blocks, Connecting 31D. 16 11/16" x 1½"			
Blocks, Connecting 2 Cord w/cover 11B			
Blocks, Connecting 12F			
Blocks, Protector No. 10			
Blocks, Protector No. 26			
Blocks, Protector No. 27			
Blocks, Protector No. 30			

ITEM	Stock In	Stock Out	Stock End of Period
Blocks, Terminal 38A			
Blocks, Terminal (W.E.) No. 85			
Blocks, Terminal (W.E.) No. 88			
Bolts, Angle Eye, Roller 5/8" x 12"			
Bolts, Carriage 3/8" x 5"			
Bolts, Carriage 1/2" x 4 1/2"			
Bolts, Carriage 3/8" x 4 1/2" No. 9634 1/2			
Bolts, Carriage 3/8" x 4"			
Bolts, Double Arming 5/8" x 14"			
Bolts, Double Arming 5/8" x 16" No. 9866			
Bolts, Double Arming 5/8" x 18" No. 9868			
Bolts, Double Arming 5/8" x 20"			
Bolts, Machine, Iron 1/4" x 6"			
Bolts, Machine, Iron 5/8" x 8"			
Bolts, Machine, Iron 3/4" x 3"			
Bolts, Machine, Iron 1" x 3 1/2"			
Bolts, Machine 3/8" x 4 1/2" No. 9604 1/2			
Bolts, Machine 1/2" x 4 1/2" No. 9704 1/2			
Bolts, Machine 1/2" x 6"			
Bolts, Machine 1/2" x 8"			
Bolts, Machine 5/8" x 3"			
Bolts, Machine 5/8" x 6" No. 9806			
Bolts, Machine 5/8" x 12"			
Bolts, Machine 5/8" x 14"			
Bolts, Machine 5/8" x 16"			
Bolts, Machine 5/8" x 18"			
Bolts, Crossarm 5/8" x 10" No. 9810			
Bolts, Crossarm 5/8" x 12" No. 9812			
Bolts, Crossarm 5/8" x 14" No. 9814			
Bolts, Crossarm 5/8" x 16" No. 9816			
Bolts, Machine 5/16" x 4"			
Bolts, Machine, Galv. 3/8" x 3" No. 9603			
Bolts, Machine, Galv. 3/8" x 3 1/2"			
Bolts, Machine 3/8" x 4"			
Bolts, Machine, Galv. 3/8" x 5 1/2"			

ITEM	Stock In	Stock Out	Stock End of Period
Bolts, Stove 5/16" x 3"			
Bolts, Stove, F.H. Galv. 5/16" x 2"			
Bolts, Stove, F.H. Galv. 5/16" x 3 1/2" No. 9233 1/2			
Bolts, Stove, F.H. Galv. 3/16" x 2" No. 9237			
Bolts, Stove, F.H. 5/16" x 12" No. 9232			
Bolts, Thimble Eye, Angle 5/8" x 10" No. 9151			
Bolts, Thimble Eye, Angle 5/8" x 12" No. 9152			
Bolts, Thimble Eye, Angle 5/8" x 14" No. 9153			
Bolts, Thimble Eye, Straight 5/8" x 10" No. 9060			
Bolts, Thimble Eye, Straight 5/8" x 12" No. 9062			
Bolts, Thimble Eye, Straight 5/8" x 14" No. 9064			
Bolts, Through 5/8" x 10" No. 9810			
Bolts, Through 5/8" x 12"			
Bolts, Through 5/8" x 14"			
Bolts, Through 5/8" x 16"			
Bolts, Through 5/8" x 18" No. 9818			
Bolts, Eye 5/8" x 10"			
Boxes, Cable, Terminal G.A.11.10 3/16" x 4 1/2"			
Boxes, Cable, Terminal G.A.16.13 3/16" x 4 1/2"			
Boxes, Cable, Terminal G.A.26.19 9/16" x 4 1/2"			
Boxes, Cable, Terminal G.B.11.10 3/16" x 6 7/8"			
Boxes, Cable, Terminal G.B.16.13 5/16" x 6 7/8"			
Boxes, Cable, Terminal G.B.26.19 9/16" x 7 3/8"			
Boxes, Cable, Terminal G.C.23			
Boxes, Cable, Terminal G.C.32.15 1/16" x 8 1/2"			
Boxes, Cable, Terminal G.C.52.21 9/16" x 8 9/16"			
Boxes, metal 3" x 8" x 10"			
Braces, Crossarm 20" x 1 1/4" x 1/4"			
Braces, Crossarm 24"			
Braces, Crossarm 26" x 1"			
Braces, Crossarm 28" x 1"			
Braces, Crossarm, Galv. 1 1/4" x 1/4" x 28"			
Braces, Crossarm 30" x 1 1/4" x 1/4" No. 104			
Brace, Diagonal, 83" No. 8050			

ITEM	Stock In	Stock Out	Stock End of Period
Brackets, Corner No. 9204			
Brackets, House No. 9200			
Brackets, Pole No. 9202			
Brackets, Pole, Wooden, Oak 1⅝" x 2" x 12"			
Brackets, Transposition 1 Point No. 9251			
Brackets, Transposition Phantom No. 9275			
Brackets, Pole, Wooden, Oak 1½" x 2" x 12"			
Brackets, Pole, Wooden, 2" x 2½" x 12"			
Backboards, 83C, 83B, & 84B			
Bulbs, 2.5 volts screw base			
Bulbs, 3.8 volts screw base			
Bulbs, Tringar No. 189049			
Buttons, Pearl, Push, No. 620			
Buttons, Push, No. 800			
Buttons, Push, No. 805			
Buzzers, C.G.E.			
Buzzers, No. 7D			
Buzzers, Dixie, No. 725			
Buzzers, No. 999 6-8 volt DC			
CABLE			
2 Pr. NJR 22 RILC J.P.			
2 Pr. NTR 22 RILC J.P. T.A.			
2 Pr. SWA 19 RILC SWA			
2 Pr. Bx. ARM 22 RILC			
3 Pr. CNB DSTA 19 PILC TA			
3 Pr. NJR 22 RILC JP			
3 Pr. SWA 19 RILC SWA			
3 Pr. DWA 19 PILC DWA			
4 Pr. NJR 22 RILC JP			
4 Pr. NTR 22 RILC DSTA			

ITEM	Stock In	Stock Out	Stock End of Period
6 Pr. DNB DSTA 19 PILC DSTA			
6 Pr. NJR 22 RILC JP			
6 Pr. NTR 22 RILC TA. JP			
6 Pr. NJS 19 PILC			
11 Pr. DNB & CNB DSTA 19 PILC			
11 Pr. CNB 19 PILC			
11 Pr. AUA & BUA 22 DCI LC			
11 Pr. AUA & BUA 24 DCI LC			
16 Pr. CNB & DNB 19 PILC			
16 Pr. DNB DSTA 19 PILC			
16 Pr. DNB DWA 19 PILC			
19 Pr. DWA 19 PILC			
19 Pr. DSTA 19 PILC			
22 Pr. BSA 22 PILC			
24 Pr. DWA 19			
24 Pr. (12 Quad) DSTA			
25 Pr. 19 ga. Swbd. L.C			
26 Pr. CNB & DNB 19 PILC			
26 Pr. DNB DSTA 19 PILC			
26 Pr. ASM 24 PILC			
26 Pr. BUA 22 DCI LC			
26 Pr. DNB DWA 19 PILC & RILC			
26 Pr. NCSM J.P			
35 Pr. DSTA 19 PILC			
39 Pr. DSTA 19 PILC			
39 Pr. DWA 19 PILC			
51 Pr. CNB & DNB 19 PILC			
51 Pr. DNB DSTA 19 PILC			
51 Pr. ASM & NCSM 24 PILC			
51 Pr. AUA & BUA 22 DCI LC			
51 Pr. BSA 22 PILC			

ITEM	Stock In	Stock Out	Stock End of Period
52 Pr. DNB DWA 19 PILC			
56 Pr. DSTA 19 PILC			
56 Pr. DWA 19 PILC			
101 Pr. CNB 19 PILC			
101 Pr. DNB DSTA 19 PILC			
Cable, Inside wiring 6 pr. (Swbd)			
Cable, Inside wiring 12 pr. Type "B" (Swbd)			
Cable, Inside wiring 20 pr.			
Cable, Switchboard 50 pr. No. 6066			
Cable, Switchboard 33 cond. No. 6183			
Cable, Switchboard 103 cond. No. 6066			
Cable Tray 6″			
Cable Tray 10″			
Caps, Receiver (for No. 144 Receiver) No. PP9313			
Caps, Lamp (for N.E. Switchboard) No. 2 AY			
Caps, Lamp (for N.E. Switchboard) No. 2 B			
Caps, Lamp (for N.E. Switchboard) No. 2 C			
Caps, Lamp (for N.E. Switchboard) No. 2 U			
Caps, Lamp, White (for S.C. Swbd) No. 31 A			
Caps, Lamp, White (for S.C. Swbd) No. 31 B			
Caps, Lamp, White (for S.C. Swbd) No. 31 C			
Caps, Receiver No. 29698			
Caps, Receiver for handset (FIA)			
Caps, Transmitter for FIA handset			
Caps, Transmitter No. 29286			
Caps, trouble 2A			
Caps, trouble 2B			
Cases, Loading Coils (26 No. 628 coils each)			
Cases, splicing for submarine cable No. 1			
Cases, splicing for submarine cable No. 2			
Cases, splicing for submarine cable No. 3			

ITEM	Stock In	Stock Out	Stock End of Period
Chambers, Binding Post G11 6′ Stub			
Chambers, Binding Post G16 6′ Stub			
Chambers, Binding Post G26 6′ Stub			
Chambers, Binding Post H51 12′ Stub			
Chambers, Binding Post H76			
Clamps, Bonding Ribbon			
Clamps, Cable ¾″			
Clamps, Cable 1″			
Clamps, Cable 1¼″			
Clamps, Cable 1½″			
Clamps, Cable 16 pr. 19 ga. ⅝″			
Clamps, Cable 101 pr. 19 ga. 5/16″			
Clamps, Cable 104 pr. 19 ga. 2⅝″			
Clamps, Cable No. 13			
Clamps, Cable No. 15101			
Clamps, Cable No. 15103			
Clamps, Cable No. 17			
Clamps, Cable, Suspension, 1 bolt No. 8901			
Clamps, Cable, Suspension, 3 bolt No. 8903			
Clamps, Dropwire, Type "P"			
Clamps, Dropwire, Type "R"			
Clamps, Grade No. 2054			
Clamps, Grade, Adjustable Type "B" No. 22053			
Clamps, Guy, 1 Bolt, Galv. No. 7741			
Clamps, Guy, 2 Bolt, Galv. No. 7448			
Clamps, Guy, 3 Bolt, Galv. No. 7449			
Clamps, Guy, 3 Bolt, 6″ No. 7450			
Clamps, One-Hole, Diamond, Malleable ¾″			
Clamps, One-Hole, Diamond, Malleable 1″			
Clamps, Pipe, 1½″			
Clamps, Pipe, 2″			
Clamps, Pipe No. 20			
Clamps, Span No. 8917			
Clamps, Station ground			
Cleats, Wood, Inside Wire			

ITEM	Stock In	Stock Out	Stock End of Period
Clips, Wire, Wiremold No. 1500 W.C.			
Clips, Dropwire			
Clips, Wire, Type "S"			
Clips, Testing			
Clips, Test, Universal (Mueller) No. 82			
Clips, Test, (Mueller) No. 27			
Clips, Wire rope No. 8488			
Cloth, Emery			
Cloths, Catch, Moleskin 6″ x 6″			
Cloths, Formed, Wiping 3″ x 3″ (Ticking)			
Coils, Heat No. 76A			
Coils, Heat No. 1232 (for S.C. (M.D.F.)			
Coil, Induction No. 72A			
Coils, Induction No. 13			
Coils, Induction No. 63			
Coils, Induction No. 113D			
Coils, Induction No. 46			
Coils, Induction No. 101A			
Coils, Induction D281569 (Phillips Elec. Co.)			
Coils, Repeating No. 25A			
Coils, Repeating No. 54B			
Coils, Repeating No. 54B Single			
Coils, Repeating No. 76A			
Coils, Repeating No. 97A			
Coils, Repeating No. 77A			
Coils, Ringer 750 chm			
Coils, Loading, Lead Sleeves Type No. 95D			
Compound, Pothead No. 227			
Compound, Sealing No. 23 (½ gal. cans)			
Compound, Sealing No. 19			
Compound, Sealing No. 30 (1 gal. cans)			
Compound, Splicing ¾″			

ITEM	Stock In	Stock Out	Stock End of Period
Condensers, No. 21D 2 Mfd.			
Condensers, No. 16 1 Mfd.			
Condensers, N.J.A. 5 Mfd.			
Condensers, .02 M.F. No. 141H.			
Condensers, 1.0 M.F. No. 149A.			
Condensers, .5 M.F. No. 2149B.			
Condensers, Combination .5 & 2 MF No. 2194D.			
Condensers, Transmitters .006 MF No. 129D.			
Condensers, 1.0 MF. No. 149E.			
Condensers, 2.0 MF. No. 2021D.			
Conduit, Creasoted 3″ (lengths).			
Conduit, ½″/Lengths.			
Conduit Bends 90° 2″.			
Conduit, Galv. 2″.			
Conduit, 1″/Lengths.			
Conduit, 1½″/Lengths.			
Connectors, Amphenol (MC4M).			
Connectors, Amphenol (PC4F).			
Connectors, Strand No. 8913.			
Cords, 4′ No. S2A (For N.E. Swbd).			
Cords, Telephone 3 cord 4′ No. CD310353.			
Cords, Telephone 4′ ND 3-A/9.			
Cords, Telephone 4 cord 9′ B100-AA1.			
Cords, Telephone 4 cord 9′ B100-AA2.			
Cords, Telephone 4′ ND 4-A-9.			
Cords, Telephone L.4.B.			
Cords, Telephone 4′ 6″ L-4-E.			
Cords, Telephone 4′ No. NH4A9.			
Cords, Telephone 6′ L.4.F. (for 2143 type).			
Cords, Telephone 9′ L.4.F. (for 2143 type).			
Cords, 4′, 4 cord L-4-R.			
Cords, Telephone No. R 2 DW (for 144 Receiver).			
Cords, Telephone No. R2 BV.			
Cords, Telephone No. MD2154.			
Cords, Telephone No. MD2153.			

ITEM	Stock In	Stock Out	Stock End of Period
Cords, 6′ 2 Cond. Green No. S2A (for NE Swbd)			
Cords, 6′ 2 Cond. Red No. S2A (for NE Swbd)			
Cords, 6′ 3 Cond. Green No. S3B (for NE Swbd)			
Cords, 6′ 3 Cond. Red No. S3B (for NE Swbd)			
Cords, 6′ No. S-24-K (for S.C. Swbd)			
Cords, Test No. W.I.T			
Cords, Test No. W.2.AG			
Cords, Test No. W.4.N			
Cranks for No. 48A Generator No. PP11234			
Crank, Generator No. PP11913			
Cranks for No. AC90116 Generator (Phillips)			
Crossarms, 4 pin			
Crossarms, 6 pin 72″ No. 5			
Crossarms, 8 pin			
Crossarms, 10 pin 120″			
Dessicant			
Diaphragm, Receiver No. PP1154 (for 114 Receiver)			
Diaphragms, No. PP12076 (for 528 Receiver)			
Discharger, Unit (for S.C., M.D.F.)			
Drops, No. 56A (for NE Swbd)			
Drop Mountings No. 87			
Duct, Fibre 3″			
Elbows, Wire Mould No. 1517A			
Extension Handles (generator No. 48A)			
Fasteners, Cord No. 9			
Form Cable, Soldering 7/8″ (pkg-6)			
Frames, Distributing No. 1420B			
Frames, Distributing No. 1425C			
Frames, Distributing No. 1431A			
Frame, Upright assembly Spec. No. 60514-17			

ITEM	Stock In	Stock Out	Stock End of Period
Fuses, 7 amp. No. 7A			
Fuses, No. 11C			
Fuses, Cartridge (Renewable type) 6 Amp			
Fuses, Cartridge (Renewable type) 10 Amp			
Fuses, Cartridge (Renewable type) 15 Amp			
Fuses, Cartridge (Renewable type) 25 Amp			
Fuses, Cart. 30 Amp. 250V			
Fuses, Chamber No. L.A. 16			
Fuses, ½ Amp. No. 35F (Indicator Alarm Type)			
Fuses, 1 1/3 Amp. No. 35A (Indicator Alarm Type)			
Fuses, No. 35E			
Fuses, 3 Amp. No. 35G (Indicator Alarm Type)			
Fuse Wire, Blow-rite Reliable, 1 Amp. (300 spools)			
Fuse Wire, Blow-rite Reliable, 2 Amp. (300 spools)			
Fuse Wire, Blow-rite Reliable, 3 Amp. (300 spools)			
Fuses, No. 11C			
Fuses, No. 60D			
Fuses, No. 60E			
Fuse Chambers, L.A. 51			
Generator, No. AC90116 (Phillips Elec. Co.)			
Generators, Magnets, No. 48A			
Gongs for No. 8 Ringer, No. PP11242			
Gongs for No. 38 Ringer, No. PP11198			
Groups, Protector, No. 1435 MPB			
Groups, Protector, No. 1435 R			
Groups, Protector, No. 1435 T			
Groups, Protector, No. 1435 U			
Guards, Guy, Universal 7′ No. 7557			
Guards, Guy, Universal 8′ No. 7558			
Guards, Thimble Eye, Angle ⅝″			
Guards, Trolley 5′ Type L 1¼″			
Guard, -U-Cable 8′ x 2 3/16″ No. 7533			
Guard, -U-Cable 8′ x 3 3/16″ No. 7535			

ITEM	Stock In	Stock Out	Stock End of Period
Handle—for F1. Handset No. F-1-3			
Handsets, Uniphone NU Type (Transmitter & Receiver units only c/w cords)			
Hangers, Messenger No. 3915			
Hangers, Messenger, 3 bolt No. 8903			
Hangers, Messenger No. 8914			
Hangers, Messenger Universal			
Heaters, Electric 115V–500 w. No. 15510H1A			
Heaters, space			
Hooks, Cord No. 5			
Hooks, Drive No. 1316			
Hooks, Guy, 4″ x 1¼″ No. 7584			
Hooks, T-Iron No. 2131			
Hooks, T-Iron, 7½″ No. 2132			
Insulators, Glass, Pony No. 9			
Insulators, Porcelain, Strain 2½″ x 2¼″			
Insulators, Porcelain, Strain 3½″ x 2¼″			
Insulators, Glass Pony No. 53			
Insulators, Pyrex Glass, 8″ No. 67017			
Insulators, Pyrex Glass, 12″			
Insulators, Glass, Toll Line No. 16			
Insulators, Glass No. 42			
Insulators, Porcelain, Strain No. 502			
Insulators, Strain 5¼″ No. 509			
Insulators, Strain 4½″			
Insulators, Strain 3¼″			
Insulators, Transposition No. 42			
Insulators, Transposition No. 53			
Insulators, Wireholders No. 1621D			
Insulators, Wireholders No. 190			

ITEM	Stock In	Stock Out	Stock End of Period
Jacks No. 141 on mountings No. 112			
Jacks No. 239A			
Jacks & Signals combined No. 22C			
Jacks & Signals combined No. 27C			
Jacks & Signals combined No. 27C (mounted Individually on 20: 92B mountings)			
Jacks & Signals combined No. 27C (mounted 5 per strip on 4—No. 89B mountings)			
Jacks No. 364 (for S.C. Swbd.)			
Jack mounting No. 2084 w/5 No. 2006A Combined Jacks & Signals			
Keys, Type A7 AF			
Keys, Special Type A1			
Keys, Special Type 92A			
Keys, Special Type 92B			
Keys, Special Type 272A			
Keys, (S.C. Swbd.) No. 341A			
Keys, (S.C. Swbd.) No. 342K			
Keys, (Text Board) No. 479K			
Keys, Type No. 479CS			
Keys, Type N I E			
Keys, Type N I G			
Knobs, Porcelain Type "C"			
Knobs, Porcelain, 2 Groove No. 9225			
Knobs, Porcelain, 4 Groove No. 9226			
Ladders, Extension, Reinforced 24′			
Links, Reinforcing, Type L 8⅜″			
Lamps, E I			
Lamps, Resistance No. 8B			
Lamps, (for S.C. Swbd. No. 220)			
Lamps, No. C2			
Lamps, Signal, Centre board No. 2G			
Lamps, Switchboard No. 2J			

ITEM	Stock In	Stock Out	Stock End of Period
Loomduct, Size ½"			
Loomduct, Size ¾"			
Loomduct, Size 1"			
Marlin (Houseline) 10 lb. balls			
Marlin (Houseline) 1 lb. balls			
Marlin, 2 ply (5 lb. balls)			
Moulding, Pancake, Wiremold No. 1500			
Mountings, Protector 48B			
Mountings, No. 200A			
Mouthpiece for 337 Transmitter No. PP17615			
Mouthpiece for 396A Transmitter			
Muslin, 2"			
Muslin, 4"			
Nails, Finishing 1½"			
Nails, Finishing 2"			
Nails, Strap, Galv. 1½" No. 6			
Nails, Common 6" No. 2			
Nails, Common 6"			
Nails, Galv. 6"			
Nails, Wire, Galv. 2" 6D			
Nails, Wire, Galv. 3"			
Nails, Wire, Galv. 4"			
Nails, Wire, Galv. 4½" 30D			
Nails, Wire, Galv. 6" 60D			
Nails, Zinc, Coated 6" No. 2			
Nails, Wiring, inside ½" Brown			
Nails, Wiring, inside ⅞" Brown			
Nuts, Eye No. 9510			
Nuts, Thimble Eye for ⅝" Bolt No. 7660			
Nuts, Thimble Eye ⅝" x 3⅝" No. 7502			
Outlets, Floor, Wiremold No. 1524			

ITEM	Stock In	Stock Out	Stock End of Period
Paraffin Wax (lbs.)			
Parawax			
Pasters, Paper 2″ (Rolls)			
Paste, Plug Cleaning (Tins)			
Paste, Soldering (Tins)			
Petroleum, Jelly			
Pins, Crossarm Wood 1¼″ x 8″			
Pins, Crossarm Wood Transposition 1¼″ x 9″			
Pins, Short Shank (Transposition Brackets) 4¼″ x 1½″ No. 8010			
Pitch (lbs.)			
Plates, Guy, curved No. 8887			
Plates, Guy, Flat No. 8891			
Plates, Numbers 1 to 50 (sets) PP113032			
Plates, Strain 4″ x 8″ No. 7575			
Plugs, No. 47A			
Plugs (for S.C. Swbd.) No. SC-61			
Plugs, No. 110			
Plugs, No. 137			
Plugs, No. 289B			
Plugs for 2142 & 2143 Tel sets			
Plugs, Rubber			
Plug Seats No. 12			
Plug Seats No. 15			
Plugs, Test 252A			
Plugs, Test 252B			
Plugs, Test (for S.C. M.F.D. 1234)			
Posts, Binding, Chambers H51			
Posts, Binding, Chambers H76			
Poles, Eastern Cedar 22′ CL 5			
Poles, Eastern Cedar 25′ CL 5			
Poles, Eastern Cedar 30′ CL 5			
Poles, Eastern Cedar 35′ CL 5			
Poles, Eastern Cedar 25′ CL 6			
Poles, Eastern Cedar 30′ CL 6			
Poles, Eastern Cedar 35′ CL 6			

ITEM	Stock In	Stock Out	Stock End of Period
Protectors, Cable Wood			
Protectors, Mountings No. 50C			
Protectors, Mounting No. 83A			
Protectors, 76			
Protectors, 83A			
Protectors, 98A			
Protectors, 1093AW			
Protectors, 1269A			
Protectors, C12, C/W. A-12 Fuses & Carbons			
Protectors, Shore End (cable) 2″			
Protectors, Shore End (cable) 2½″			
Protectors, Shore End (cable) 3″			
Protectors, Station, complete, 98A			
Punchings, Terminal			
Racking Cable, 6″ wide 9′ 8½″			
Racking Cable, 12″ wide 9′ 8½″			
Racking Underground Cable, No. 2125			
Racks, Underground Cable, 2½ ft.			
Racks, Underground Cable, 2 ft.			
Rawl Plugs, 1″ x No. 8			
Recliner, No. 538			
Recliner, No. 48			
Recliner, No. 706A			
Recliner Caps (for monophone)			
Receiver Unit, D-5154A			
Receiver Unit, No. HA. 1			
Reels and Lagging			
Relays, Leach, Type 1013			
Relays, No. A. 1			
Relays, No. 125S			
Relays, (for S.C. Swbd.) No. 192A			
Relays, (for S.C. Swbd.) No. 2572 W-EY			
Relays, (for S.C. Swbd.) No. 2572 W-FY			

ITEM	Stock In	Stock Out	Stock End of Period
Resistance, 200 Ohms No. 18 G			
Resistance, 300 W No. 18 AF			
Resistance, 600 W No. 18 AF			
Resistor, 30 Watt			
Ribbon, Bonding Plain 7/8"—17'			
Ringers, No. 8A			
Ringers, MC 56221 G			
Ringers, 2500 Ohms. No. 38B			
Rings, Bridle (Type E) 5/8" x 1" No. 2154			
Rings, Bridle (Type C) 1¼" x 1 7/16" No. 2156			
Rings, Cable strand No. 2161½			
Rings, Cable strand No. 2162			
Rings, Cable Aerial 1½" x 4¾" No. 2181½			
Rings, Distributing No. 8A			
Rings, Drive ½" No. 2154			
Rods, Anchor 5/8" x 7' No. 8517			
Rods, Anchor, Double Pulley No. 9477D-1			
Rods, Anchor, Double Thimble Eye No. 8505			
Rods, Anchor, Thimble Eye ½" x 7' No. 8507			
Rods, Anchor, Thimble Eye 5/8" x 6' No. 8516			
Rods, Anchor, Thimble Eye 5/8" x 8' No. 8518			
Rods, Ground Iron w/copper wire 5' No. 9505			
Rods, Ground Iron w/copper wire ½" x 6' No. 8506			
Rope, Manilla ¼"			
Rope, Manilla ½"			
Rope, Manilla 9/16"			
Rope, Manilla 5/8"			
Sandpaper, No. 0			
Sandpaper, No. 1			
Sandpaper, No. 1½			
Scantlings, 2" x 4"			

ITEM	Stock In	Stock Out	Stock End of Period
Screws, Angle 3″ No. 2210			
Screws, Angle 5/16″ No. 2214			
Screws, Angle 3/8″ x 3″ No. 2215			
Screws, Binding Cord (for 47A Plugs) No. P82239			
Screws, Binding Cord (for 110 Plugs) No. P82341			
Screws, Coach 1/4″ x 2 1/2″			
Screws, Coach, Galv. 5/16″ x 3 1/2″			
Screws, Coach, Galv. 3/8″ x 3 1/2″			
Screws, Coach, Galv. 1/2″ x 4 1/2″			
Screw Eyes, Insulated 5/8″ x 1″ No. 2217			
Screw Eyes, Insulated 5/8″ x 2″ No. 2218			
Screw Eyes, Insulated 1″ x 1 1/8″			
Screw Eyes, Insulated 1″ x 1 1/2″ No. 2220			
Screw Eyes, Insulated 1″ x 2 1/8″ No. 2221			
Screws, Fetter Drive 1/2″ x 4 1/2″			
Screws, Wood, F.H. Brass 1/2″ No. 6			
Screws, Wood, F.H. Bright 1/2″ No. 8			
Screws, Wood, F.H. Bright 3/4″ No. 6			
Screws, Wood, F.H. Bright 1″ No. 5			
Screws, Wood, F.H. Bright 1″ No. 6			
Screws, Wood, F.H. Bright 1″ No. 8			
Screws, Wood, F.H. Bright 1″ No. 12			
Screws, Wood, F.H. Bright 1 1/4″ No. 8			
Screws, Wood, F.H. Bright 1 1/2″ No. 8			
Screws, Wood, F.H. Bright 1 1/2″ No. 14			
Screws, Wood, F.H. Bright 2 1/4″ No. 14			
Screws, Wood, F.H. Galv. 2 1/2″ No. 18			
Screws, Wood, F.H. Galv. 3″			
Screws, Wood, F.H. Galv. 3″ No. 18			
Screws, Wood, F.H. Galv. 3 1/2″ No. 18			
Screws, Galv. 3 1/2″			
Screws, Lag 1/4″ x 2″			
Screws, Lag 1/4″ x 2 1/2″ No. 9722 1/2			
Screws, Lag 5/16″ x 2 1/2″ No. 9732 1/2			

ITEM	Stock In	Stock Out	Stock End of Period
Screws, Lag 5/16" x 3½" No. 9733½			
Screws, Lag 3/8" x 2½"			
Screws, Lag 3/8" x 3" No. 9743			
Screws, Lag 3/8" x 3½"			
Screws, Lag 3/8" x 4"			
Screws, Lag 3/8" x 4½"			
Screws, Lag ½" x 4"			
Screws, Lag ½" x 4½" No. 9754½			
Screws, Lag ½" x 6½" No. 9756½			
Screws, R.H. Blued ½" No. 10			
Screws, Wood, R.H. Blued ¾" No. 7			
Screws, R.H. Blued 1" No. 6			
Screws, Wood, R.H. Blued 1" No. 8			
Screws, Wood, R.H. Blued 1¼" No. 8			
Screws, R.H. Blued 1½" No. 8			
Screws, Wood, R.H. Blued 1½" No. 8			
Screws, Wood, R.H. Blued 1½" No. 10			
Screws, Wood, R.H. Blued 2" No. 8			
Screws, Wood, R.H. Blued 2" No. 10			
Screws, Wood, R.H. Blued 2" No. 14			
Screws, Wood, R.H. Blued 2" No. 18			
Screws, Wood, R.H. Blued 2½" No. 8			
Screws, Wood, R.H. Blued 2½" No. 10			
Screws, Wood, R.H. Blued 3" No. 14			
Screws, R.H. Bright ¾" No. 6			
Screws, Wood, R.H. Bright ¾" No. 8			
Screws, R.H. Bright 1" No. 8			
Screws, Wood, R.H. Bright 1½" No. 7			
Screws, R.H. Bright 1½" No. 8			
Screws, Wood, R.H. Bright 2½" No. 6			
Screws, Wood, R.H. Galv. 2½" No. 12			
Screws, Wood, R.H. Galv. 2½" No. 14			
Screws, Shell (for 110 Plugs) No. P.81299			
Screws, Shell (for 47A Plugs) No. P.82233			
Screws, Transmitter Rim Mtg. No. P.P.28529			

ITEM	Stock In	Stock Out	Stock End of Period
Sets, Operator (for S.C. Swbd.) No. 4			
Shells, Receiver No. PP 9312			
Signal Mounting w/31D combined Jack & Signal 101C No. A24780			
Sleeves, Lead Antimony 1″ x 8′			
Sleeves, Lead Antimony 1″ x 15″			
Sleeves, Lead Antimony 1¼″ x 8′			
Sleeves, Lead Antimony 1¼″ x 15″			
Sleeves, Lead Antimony 1½″ x 8′			
Sleeves, Lead Antimony 1½″ x 15″			
Sleeves, Lead Antimony 1½″ x 17″			
Sleeves, Lead Antimony 1¾″ x 15″			
Sleeves, Lead Antimony 1¾″ x 17″			
Sleeves, Lead Antimony 2″ x 6′			
Sleeves, Lead Antimony 2″ x 15″			
Sleeves, Lead Antimony 2″ x 17″			
Sleeves, Lead Antimony 2″ x 20″			
Sleeves, Lead Antimony 2¼″ x 17″			
Sleeves, Lead Antimony 2½″ x 8′			
Sleeves, Lead Antimony 2½″ x 20″			
Sleeves, Lead Antimony 2½″ x 22″			
Sleeves, Lead Antimony 3″ x 17″			
Sleeves, Lead Antimony 3″ x 20″			
Sleeves, National, Splicing, Double Tube Tin Steel			
Sleeves, Nicopress 1-102-C			
Sleeves, Nicopress 1-114-D			
Sleeves, Nicopress 1-128-E			
Sleeves, Nicopress 3-025-A			
Sleeves, Nicopress 3-045-A			
Sleeves, Nicopress 3-045-B			
Sleeves, Nicopress 3-051-B			
Sleeves, Nicopress 4-109-C			
Sleeves, Nicopress 5-109-D85			
Sleeves, Nicopress 5-109-D135			
Sleeves, Nicopress 9-5-109D			

ITEM	Stock In	Stock Out	Stock End of Period
Sleeves, Prepared Cotton Single 1/8"			
Sleeves, Prepared Cotton Single 5/32"			
Sleeves, Prepared Cotton Single 1/4"			
Sleeves, Prepared Cotton Single 3" x 3/16" (200/Box)			
Sleeves, Prepared Cotton Single 3" x 1/4" (175/Box)			
Sleeves, Prepared Cotton, 1 lb. roll			
Sleeves, Servi 5/32" strand			
Sleeves, Servi 3/16"			
Sleeves, Servi 5/16" strand No. 7453			
Sleeves, Servi 9/32" strand No. 7457			
Sleeves, Steel Size 109			
Soap, Soft, (Tins)			
Sockets, Lamp (for S.W. Swbd.) No. 13			
Sockets, Lamp No. 49A			
Sockets, Rubber, Standard Lighting, 110 v			
Solder, 38/62 Wiping			
Solder, 40/60 Wiping			
Solder, 50/50 Wiping			
Solder, Resin Core			
Spun-Yarn, 3 Ply Tarred			
Spun-Yarn, 5 Ply			
Staples, Insulated No. 1			
Staples, Insulated No. 3			
Steps, Pole Steel, Std. No. 7125			
Sterine, 4 oz. (sticks)			
Strand, 7/16" Zinctite Hard Grade 3/16" diam.			
Strand, 7/13—9/32 Crucible Grade			
Strand, 7/12 Zinctite 5/16" diam. (crucible)			
Strand, 7/12 Zinctite 5/16" diam. (hard grade)			

ITEM	Stock In	Stock Out	Stock End of Period
Straps, Cable No. 13			
Straps, Cable No. 20			
Straps, Cable, Slater 1 1/16" No. 2144			
Straps, Cable, Slater No. 2146			
Straps, Cable, Slater No. 2147			
Straps, Cable, U-Guard No. 7439			
Straps, Cable, U-Guard No. 7450			
Straps, Crossarm, 4" x 5" No. 1024			
Straps, Guy Storm 1/4" x 1 1/2" x 7" No. 6001—No. 2063			
Straps, Pipe 1/2"			
Straps, Pipe 1"			
Straps, Pipe 1 1/4"			
Straps, Pipe for 3" Conduit			
Straps, Wall No. 8892			
Strips, Fanning No. 10			
Strips, Fanning No. 15A			
Strips, Fanning No. 15B			
Strips, Terminal No. 65			
Struts, Guy No. 2055			
Supporters, Cable Slater, No. 1, No. 22121			
Supporters, Cable Slater, No. 2, No. 22122			
Supporters, Cable Slater, No. 4, No. 22124			
Supporters, Messenger			
Switches, D.P.D.T. (30 Amps.)			
Switches, D.P.S.T. (30 Amps.)			
Switches, S.P.D.T.			
Switches, Toggle No. 921			

ITEM	Stock In	Stock Out	Stock End of Period
Tape, Cotton, ¾″			
Tape, Cotton, 1″			
Tape, Friction (Black) ¾″			
Tape, Friction 1½″ Rolls			
Tape, Plug Cleaning			
Tape, Rubber ¾″			
Tape, Rubber 2″ (Rolls)			
Tape, Transmitter attachment (yards)			
Telephone Sets, Operators No. 4			
No. 234A Transmitter attachment No. 3A			
Plug No. 137 and cord No. 1.4 E			
Terminal Cable BD 101 26⅞ x 10, 3/16 x 8½			
Terminal Cable BD 102			
Terminal Cable BD 202 44½ x 10, 3/16 x 8½			
Terminal Cable F-10 5½′ stub			
Terminal Cable F-16 5½′ stub			
Terminal Cable F-26			
Terminals, "G" Type 11 Pr. L.P.			
Terminals, "G" Type 16 Pr. L.P.			
Terminals, "G" Type 20 Pr. L.P.			
Terminals, "G" Type 28 Pr. L.P.			
Terminals, "G" Type 51 Pr. L.P.			
Terminals, Cable L.A. 16			
Terminals, Cable L.A. 26			
Terminals, Cable L.A. 51			
Terminals, Cable Sections L51			
Terminals, Cable Sections M51			
Thimble Eye Guy Slater, No. 1100			
Thimble Eyes, Angle ⅝″			
Thimbles, Guy ⅜″			
Thimbles, Guy ⅝″			
Thimbles, Eye Nut No. 22115			
Tips, Telephone Cord No. 29			
Tips, Telephone Cord No. 100			
Tips, Telephone Cord No. 101			

ITEM	Stock In	Stock Out	Stock End of Period
Tips, Telephone Cord No. 102			
Tips, Telephone Cord No. 114			
Tips, Telephone Cord No. 120			
Tips, Telephone Cord No. 121			
Transmitter Unit No. D38309B			
Transmitter Units No. F-1			
Transmitter No. A.E. Co35 A7			
Transmitter No. 234			
Transmitter No. 266 (for Lineman's test set)			
Transmitter No. 337			
Transmitter No. 323			
Transmitter No. 396A			
Transmitter No. N.425			
Transmitter Cap (for monophone)			
Tubes, Porcelain 5/16" x 6"			
Tubes, Porcelain 5/8" x 6"			
Tubes, Porcelain 3/4" x 6"			
Tubes, Porcelain 3/4" x 12"			
Twine, Lacing No. 6 (cord for lacing cable)			
Twine, Lacing No. 12 Eleven cord (for lacing)			
Washers, Brass No. 10			
Washers, Curved, Galv. 3 1/4" x 3", 1/8 x 1/4", No. 7825			
Washers, Round, Galv. 1" x 3/8"			
Washers, Round, Galv. 1" x 7/16" No. 7801			
Washers, Square, Galv. 2" x 2" x 3/16" No. 7841			
Washers, Square, Galv. 2 1/4" x 2 1/4" x 3/16" No. 7814			
Washers, Square, Galv. 4" x 4" x 3/16" No. 7818			
Wedges, Lead No. 1			
Wedges, Lead No. 2			
Wedges, Rock Anchor, 2 1/2"			

ITEM	Stock In	Stock Out	Stock End of Period
Wire Bogen 1302-S 2Cdv.C.B. Overshield			
Wire Bridle 2/20 (ft.)			
Wire Bridge Brown 2/22 ga.			
Wire Copper H.D. No. 8 BWG. 165″ Diam.			
Wire Copper H.D. No. 9 B&S. 114 mil Diam.			
Wire Copper H.D. No. 10 N.B.S. .128″ Diam.			
Wire Copper H.D. No. 12 N.B.S. .104″ Diam.			
Wire Copper Tie .104″ Diam.			
Wire Copper Tie 114 mil Diam. 22″ long			
Wire Copper Tie 128 mil Diam.			
Wire D 8 Mk III Twisted			
Wire D 8 Mk VI Single			
Wire Distributing Frame Type L. 2/22			
Wire Distributing Frame Type L. 3/22			
Wire Drop Style HC. 2/16 B. & S.			
Wire Drop Type C.S. 2/17			
Wire Duct 2-Condr. 22 ga.			
Wire Ground 14 ga. S.S.G.			
Wire Ground 16 ga.			
Wire Holders 3½″ No. 1647			
Wire Inside 2 conductor 22 ga. Brown			
Wire Inside 2 conductor 22 ga. Cream			
Wire Inside Brown, 3 Cndr. 22 ga.			
Wire Lashing			
Wire Piano (for splitting lead sleeves)			
Wire R 9450A			
Wire Steel Line No. 6 BWG. .203″ Diam. (lbs.)			
Wire Steel Line No. 9 BWG. .148″ Diam.			
Wire Steel Zinctite 109 mil 85 Grade			
Wire Steel Zinctite 203 mil 60 Grade			
Wire Steel Zinctite Galv. No. 12 BWG. 109 mil			
Wire Tie Steel Size 109 length 12″			
Wire Telephone Switchboard TESDC 22 ga.			
Wire "U" Distribution			
Wire Wire B.C. Shielded & Braided 2/22 B. & S. No. 9450B			

MECHANICAL & ELECTRICAL CHARACTERISTICS OF OPEN WIRE & CABLE

AMERICAN or CANADIAN	MECHANICAL & ELECTRICAL CHARACTERISTICS						SPLICING TOOL & SLEEVE			BRITISH	REMARKS
DESCRIPTION	Approx Gauge	Breaking Strength Pounds	Wire Wt. Per Loop Mi Pounds	D.C. Res. Per Loop Mi OHMS	V.F. Talking Range Miles	Attenuation in db per Mile	Nicopress Tool	Nicopress Sleeves	Length of Sleeve Inches	DESCRIPTION	
P.I.L.C. Tel. Cable	26 B&S			440	8.5	2.67				ASPC Cable	
ASM P.I.L.C. Tel. Cable	24 B&S			276	10.3	2.14				6½ lb. ASPC Cable	
BSA " " "	22 B&S			175	12.0	1.79				10 lb. " "	
CNB " " "	19 B&S			86	15.2	1.26				20 lb. " "	
NH " " "	16 B&S			42	27.1	.75				40 lb. " "	
COPPER - OPEN WIRE											
72 Mil H.D. Copper Wire	13 AWG	358	166	21	230	.11	CJ	1-064C	1½"	Cdn. substitute for 70 lb. cadmium copper (now discontd)	
80 Mil H.D. Copper Wire	14 NBSG	330	204	17.5	230	.11	CJ	1-080C	1½"	100 lb. H.D. Copper Wire	
104 Mil H.D. Copper Wire	12 NBSG	550	346	10.3	370	.074	CJ	1-102-C	1½"	150 lb. H.D. Copper Wire	x (C-104-C)
114 Mil H.D. Copper Wire	9 AWG	661	418	8.4	445	.062	CJ	1-114J	2½"	200 lb. H.D. Copper Wire	
128 Mil H.D. Copper Wire	10 NBSG	819	524	6.8	520	.052	CJ	1-128J	2½"	250 lb. H.D. Copper Wire	
165 Mil H.D. Copper Wire	8 BWG	1325	870	4.1	750	.034	CJ	1-162J	2½"	400 lb. H.D. Copper Wire	
BRONZE OPEN WIRE											
51 Mil Bronze Wire	16 AWG	216	84	91	100	.33	17 BA	3-051B	1¼"	40 lb. Bronze Wire	
64 Mil Bronze Wire	14 AWG	341	135	52	130	.23	CJ	1-064C	1½"	70 lb. Bronze Wire	
102 Mil Bronze Wire	10 AWG	838	330	24	215	.14	CJ	1-102J	2½"	150 lb.Bronze Wire	
CU - STEEL (COPPERWELD)OPEN WIRE										NOTE:-	
81 Mil 40% Copperweld(Cu-steel)	12 AWG	710	192	42.6	120	.23	CJ	1-080J	2½"	AWG - Commercial Standard	
102 Mil 40% Copperweld(Cu-steel)	10 AWG	1130	306	26.9	170	.17	CJ	1-102J	2½"	NBSG - U.S. Army Standard	
80 Mil 40% " "	14 NBSG	770	187	42.8	120	.23	CJ	1-080-J	2½"		x (C-080-C)
104 Mil 40% " "	12 NBSG	1172	317	25.3	175	.16	CJ	1-102-J	2½"		x (C-104-Q)
128 Mil 40% " "	10 NBSG	1647	480	16.7	235	.12	No available sleeve to fit CJ tool but could be manufactured				
102 Mil 30% " "	10 AWG	1230	306	35.8	140	.20	CJ	1-102J	2½"		
104 Mil 30% " "	12 NBSG	1270	317	33.8	140	.21	CJ	1-102J	2½"		
128 Mil 30% " "	10 NBSG	1800	480	22.3	185	.15	No available sleeve to fit CJ tool but could be manufactured				
CADMIUM COPPER OPEN WIRE											
61 Mil Cadmium Copper Wire	16 AWG	170	83	52	130	.23				40 lb. Cadmium Copper Wire	
64 Mil " " "	14 AWG	268	130	30	188	.16	CJ	1-064C	1½"	70 lb. Cadmium Copper Wire	
102 Mil " " "	10 AWG	680	332	1.8			CJ	1-102J	2½"	150 lb.Cadmium Copper Wire	
GALVANIZED STEEL OPEN WIRE											
203 Mil Galv Steel	6 BWG	1650	1160	20			(Sleeve not required)		)		
148 Mil " "	9 BWG	785	616	30.6	118	.235	CJ	2-148J	2½")	(200 lb. & 400 lb. iron	
134 Mil " " (BB)	10 BWG	1200	516	45	110	.27	CJ	2-134J	2½")	have no counterpart)	x (S-134-Q)
109 Mil " Iron (BB)	12 BWG	475	336	68.24	81	.30	CJ	5-109C	2½")	Approx. 11GA and 8GA	
109 Mil Galv H.S. Steel (85)	12 BWG	793	336	68.24	81	.30	CJ	5-109C	2½")	BWG)	
109 Mil Galv H.S. Steel (135)	12 BWG	1213	336	72	97	.30	CJ	2-109-J	2½")		x (S-109-C)
83 Mil Galv H.S. Steel (135)	14 BWG	700	198	124	81	.36	CJ	3-083-C	2½")		

Notes:- (1) First figure of Nicopress sleeve signifies material of which sleeve is made, 1 copper, 2 galv. copper, 3 bronze, 4 galv. bronze, 5 galv. steel. Next three figures represent the mil size - the letter at the end denotes tool groove.

(2) All sleeves are at least equal to 95% of the breaking strength of the wire.

(3) Where rolling tools are not in general use Nicopress are recommended for provision, being quicker, cheaper and less cumbersome. The CJ tool being a commercial item is in good supply and can be used for any wire encountered in Fixed Signal Services or L of C construction.

(4) Sleeve sizes although not corresponding in all cases to wire mil size will fit wire specified.

Common Useage - U.K. - U.S. & Canada.

x Standard Wire used in U.S. Army and special sleeves developed for use with Nicopress tools or Rolling Tools, Nicopress tool is special CQ tool made for U.S. Army.

OFFICE OF THE DIRECTOR OF SIGNALS

APPENDIX "I"

1. Scale of Apparatus for C.D.
2. Scale of Apparatus for A.A.
3. Fixed Signals Services Equipment.

FIXED SIGNAL SERVICES
SCALE OF SIGNAL APPARATUS FOR COAST DEFENCE

FORM NO. 708

DIRECTORATE OF SIGNALS "ARMY"
OTTAWA - CANADA

FORTRESS .....

BATTERY .....

ROLE - COUNTER BOMBARDMENT OR C.B. WITH CLOSE DEFENCE.

	APPARATUS SIGNAL												APPARATUS ALARM				SWITCH BOARDS				TELEPHONES MAGNETO										MISCELLANEOUS									
	APPARATUS LOUDSPEAKING NO. 1. CDN. AMPLIFIER & MICROPHONE (CONTRIO UNIT)		APPARATUS LOUDSPEAKING NO. 1. CDN. LOUDSPEAKER.		BATTERIES - 6 VOLT, 140 A.H.		INDICATOR 6 LIGHT.		INDICATOR 2 LIGHT.		RACKS MOUNTING - CAN. PATTERN. (FOR APPARATUS L/S, BAT. & INDICATORS)				BELLS LOUDRINGING.		GENERATORS ALARM.		CONCENTRATOR 5 LINE.				HAND SET - WALL.		HAND SET - DESK.		HEAD & BREAST SET - SINGLE		HEAD & BREAST SET - DOUBLE		"F" SET (WITH HAND TELEPHONE)				KEY NO. 6017E.		CHANGE OVER SWITCH - 8 POLE MAGSLIP OR EQUIVALENT.							
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
B.O.P. VISUAL															2		2								C 1		D 2															
B.O.P.- RADAR — OBSERVATION RM.															2		2								C 1		E 5															
B.O.P.- RADAR — EQUIPMENT ROOM															1										F 2		G 7								H 1							
B.P.R.															2		2		L 1						J 2		K 7															
C.P. (9.2" or 6" 45° Bty.)	1		1		4		1												1						1		1										T 2					
NO. 1 GUN			1						1								M 1														0 1									
NO. 2 GUN			1						1																						0 1									
NO. 3 GUN			1						1																						0 1									
BATTERY ENGINE ROOM																			1						P 2															
NO. 1 WAR SHELTER															1																									
NO. 2 WAR SHELTER															1																									
NO. 3 WAR SHELTER															1																									
NO. 1 PUMP CHAMBER																							N 1				Q 1													
NO. 2 PUMP CHAMBER																							N 1				Q 1													
NO. 3 PUMP CHAMBER																							N 1				Q 1													
BARRACKS - MESS ROOMS - ETC.															R ?																									
B.O.P. CLOSE DEFENCE	1		1		2		1				1				2		2		1						S 2															
S.L. COMDRS. POST AND S.L.D.S.																	1		1						U 2															
NO. 1 C.A.S.L.															1								1																	
NO. 2 C.A.S.L.															1								1																	
S.L. ENGINE ROOM															1								1																	

-: NOTES :-

(A) AUTHORIZED.
(B) INSTALLED.
(C) F.C. TELEPHONE.
(D) F.O.O. AND I.O.
(E) F.O.O., FORTRESS, AIR, RADAR, NO. 17A DIRECTOR OBSERVER.
(F) FOR NO. 7, THE SECOND TELEPHONE ON CIRCUIT TO B.E.R. IF POWER SUPPLIED FROM (THIS SOURCE.
(G) FOR NO's. 1, 2, 3, 4, 5, 6, and 8.
(H) FOR NO. 1 OF RADAR DETACHMENT.
(I) ONE ON THE F.C. TEL. AND ONE ON THE B.C's. CONCENTRATOR IF GUN ANGLE COMPUTERS (ARE USED.
(K) FOR P.O., RADAR TEL., NO.1, TURNS OP., FORT. TEL., AIR TEL., C.C. OP.
(L) ONLY REQUIRED IF GUN ANGLES COMPUTERS ARE USED.
(M) ONLY REQUIRED AT GUNS WHERE LOOKOUT IS MAINTAINED.
(N) IN PUMP CHAMBER ON ENGINE ROOM CIRCUIT. (ONLY REQUIRED WHEN THERE IS ENGINE - ATTENDAND IN P.C.)
(O) ON G.P.O!s CIRCUIT.
(P) ONE ON CONCENTRATOR AND ONE ON G.P.O's CIRCUIT.
(Q) ONLY REQUIRED IF GUN ANGLES COMPUTERS ARE USED.
(R) ONE IN EACH BARRACK BUILDING, EACH MESS HALL, EACH CANTEEN.
(S) ONE ON F.C. CIRCUIT AND ONE ON CONCENTRATOR.
(T) ONLY REQUIRED IN BATTERIES WITH COMBINED ROLE.
(U) ONE ON CONCENTRATOR AND ONE ON CIRCUIT TO O.C.S.L.

FOR CIRCUIT DIAGRAMS REFER TO DIRECTORATE OF SIGNALS "ARMY" DRAWINGS NO!s B - 1 - 128 and B - 1 - 130.

ON CHARGE OF .....
Officer Commanding.

CHECKED BY .....
R.C. Signals.

DATE ..... File No. H.Q.S. 8945-2-0.

FIXED SIGNAL SERVICES

SCALE OF SIGNAL APPARATUS FOR COAST DEFENCE

FORM NO. 709

DIRECTORATE OF SIGNALS "ARMY"
OTTAWA - CANADA

FORTRESS .....

BATTERY .....

ROLE : CLOSE DEFENCE - 4"
TWIN NAVAL.

	APPARATUS SIGNAL										APPARATUS ALARM				SWITCH BOARDS				TELEPHONES - MAGNETO												MISCELLANEOUS									
	LOUDSPEAKER (TELEPHONE L/S NO.2 ASSEMBLY)		CONTROL UNIT CDN. MK. I. (TELEPHONE L/S NO.2)		BATTERIES - 6 VOLT-140 A.H.						BELLS LOUDRINGING.		GENERATORS ALARM.		CONCENTRATOR 5 LINE.				HANDSET - WALL.		HANDSET - DESK.		HEAD & BREAST SET - SINGLE.		HEAD & BREAST SET - DOUBLE.		"F" SET WITH HAND TELEPHONE.				KEY NO. 6017B.		KEY NON-LOCKING NO.479 C.S.							
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
RADAR B.O.P. - OBSERVATION ROOM.			1		2						2		2		1						2		3																	
RADAR B.O.P. - EQUIPMENT ROOM.											1										1		6								1									
SECTION COMMAND POST.			1		2						2		3		1						2		1		1							1								
NO. 1 GUN	1												1														1													
NO. 2 GUN	1																										1													
NO. 1 WAR SHELTER											1																													
NO. 2 WAR SHELTER											1																													
S.L.D.S.													1		1						2																			
C.A.S.L. NO. 1.											1								1																					
C.A.S.L. NO. 2.											1								1																					
S.L.E.R.											1								1																					
BARRACKS - MESS ROOMS ETC.											C ?																													

- : NOTES : -

(A) AUTHORIZED.
(B) INSTALLED.
(C) ONE IN EACH BARRACK ROOM - MESS ROOM - CANTEEN.

FOR CIRCUIT DIAGRAM REFER TO DIRECTORATE OF SIGNALS "ARMY"
DRAWING NO. B - 1 - 127.

ON CHARGE OF .....
Officer Commanding.

CHECKED BY .....
R.C.SIGNALS.

DATE ..... FILE NO. H.Q.S.8945-2-0

FIXED SIGNAL SERVICES
SCALE OF SIGNAL APPARATUS FOR COAST DEFENCE

FORM NO. 710

DIRECTORATE OF SIGNALS "ARMY"
OTTAWA - CANADA

FORTRESS .....

BATTERY .....

ROLE : CLOSE DEFENCE 6 ".
(WITH RADAR)

	APPARATUS SIGNAL										APPARATUS ALARM				SWITCH BOARDS				TELEPHONES - MAGNETO												MISCELLANEOUS									
	LOUDSPEAKER. (TELEPHONE I/S NO.2 ASSEMBLY)		CONTROL UNIT - GND. MK. I. (TELEPHONE I/S NO.2)		BATTERIES - 6 VOLT -140 A.H.						BELLS LOUDRINGING.		GENERATORS - ALARM.		CONCENTRATOR 5 LINE.				HANDSET WALL.		HAND SET r DESK.		HEAD & BREAST SET - SINGLE.		HEAD & BREAST SET - DOUBLE.		"F" SET WITH HAND TELEPHONE.				KEY NO. 6017E									
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
RADAR B.O.P.- OBSERVATION ROOM			1		2						2		2		1						2		2																	
RADAR B.O.P.- EQUIPMENT ROOM											1										1		6								1									
VISUAL B.O.P.-OBSERVATION ROOM			1		2						2		3		1						2																			
S.L.D.S.													1		1						2																			
NO. 1 GUN.	1																												1											
NO. 2 GUN.	1																												1											
NO.1 WAR SHELTER.											1																													
NO.2 WAR SHELTER.											1																													
S.L.E.R.											1								1																					
C.A.S.L. NO. 1.											1								1																					
C.A.S.L. NO. 2.											1								1																					
BARRACKS - MESS ROOMS - ETC.											C ?																													

-: NOTES :-

(A) AUTHORIZED.
(B) INSTALLED.
(C) ONE IN EACH BARRACK ROOM - MESS ROOM - CANTEEN.

FOR CIRCUIT DIAGRAM REFER TO DIRECTORATE OF SIGNALS "ARMY"
DRAWING NO. B - 1 - 181.

ON CHARGE OF .....
Officer Commanding.

CHECKED BY .....
R.C.Signals.

DATE ..... FILE NO. H.Q.S.8945-2-0.

FIXED SIGNAL SERVICES

INVENTORY OF SIGNAL APPARATUS = A A O R

SECRET

AAOR-No. Location	Swbd. 20 line Cordless		Swbd. 10 line Cordless		Concentrator 5 Line		Swbd. U.C.10		Acknowledgement Lights		Keys-Order Wire Group of # 69A		Push Button #1006A Buzzer # 7B		Radio		Telephone Set.-F.		Attachment Headgear Double MK. III		Telephone Set Commercial Type					
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
AADC																										
GDO																										
GDOA																										
I.O.																										
ARP																										
RCAF																										
RCN																										
SLO																										
Telephonists (Swbd)																										
Message Board																										
Misc. Flying Board																										
Plotter A (ZPI Table)																										
Plotter B (ZPI Table)																										
Plotter C (PF Table)																										
Plotter D (PF Table)																										
Plotter E (PFTable)																										
Plotter F (PF Table)																										
Plotter G (RCAF Table)																										
Plotter H (RCAF Table)																										
Plotter J (RCAF Table)																										
Plotter K (RCAF Table)																										
Plotter L (Indicator Bd)																										

NOTES

1= Autherized

2= Installed

(a) No alteration to the Fixtures or Inventory is to be made by other than a Representative of the Chief Signal Officer.

ON CHARGE OF _____

Officer Commanding.
(R.C. SIGNALS)

DATE.

CHECKED BY.

DATE

Form No.

FILE No. E-1-48

Plotter E (PF Table)

FIXED SIGNAL SERVICES

INVENTORY OF SIGNAL APPARATUS H.A.A. SITE

(CP-PR GUNS AND ASSOCIATED BARRACKS ETC.)

SECRET.

Bty. No. Location (City etc.) Map Ref.	Swbd. Type UC-10 (d)		Swbd. 10 Line Cordless		Concentrator 5-Line (d)		Telephone Set "F"		Attachment Headgear Double MK. III		Telephone Set Commercial Type (d)		Apparatus Loudspeaking NO2 Complete Station		Bells Alarm		Generator Alarm		Radio.							
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Telephonist.	1		1		1		(b) 2		1								1		1							
P.O.A.							1		1																	
PL.1							(a) 1		(a) 1																	
PL.3							1		1																	
PL.4							1		1																	
PL.5							1		1																	
PL.6							2		1																	
PL. 7							1		1																	
G.P.O.							1																			
G.P.O.A.							1		1					1												
P2							(a) 1		(a) 1																	
P3							(a) 1		(a) 1																	
P8							1		1																	
PF.1. (in PF Trailer)							1		1																	
PF.6. (in PF Trailer)							1		1																	
GDOA							(c) 1		(c) 1																	
AADC							(c) 1																			
Bty. HQ's							(c) 2											1								
Barracks, Messes, etc.																		.7								

NOTES

(a) Only required when vertical Screen Procedure is in use.
(b) One is the Swbd. Set and the other on a direct line to Bty. HQ.
(c) Only required if Site has Sub-AAOR Function.
(d) Interim Equipment (to be replaced by cordless Swbd. and for "F" Sets)
(e) One on Administration Exchange and one on direct line to PR-CP
(f) No alteration to the fixtures or Inventory is to be made by other than a Representative of the Chief Signal Officer.

1 = Authorized
2 = Installed

ON CHARGE OF _____
Commanding Officer

DATE.

CHECKED BY. (R.C. SIGNALS)

DATE. FORM NO.

FIXED SIGNAL SERVICES EQUIPMENT

FORM 707

SERIAL NO.	H.Q. OR UNIT & LOCATIONS	ROLE	APPARATUS LOUDSPEAKING				APPARATUS ALARM		SWITCHBOARDS						TELEPHONES							MISCELLANEOUS							REMARKS
			AMPLIFIERS	INDICATORS 6-LIGHT	INDICATORS 2-LIGHT	LOUDSPEAKERS	BELLS LOUD RINGING	GENERATORS (WITH BOXES)	AUTOMATIC	COMMON BATTERY	MAGNETO (CORD TYPE)	MAGNETO (CORDLESS)	10 LINE U.C.	6 LINE U.C.	COMMON BATTERY HANDSET (WALL)	COMMON BATTERY HANDSET (DESK)	MAGNETO HANDSET (WALL)	MAGNETO HANDSET (DESK)	MAGNETO H & B (SINGLE)	MAGNETO H & B (DOUBLE)	TELEPHONE SET "F"	CONCENTRATE 5-LINE	TELEPHONE L.S. #2 COMPLETE	ATTACHMENTS HEADGEAR DUPLEX	MODEL NO.15 TELETYPE MACH	MODEL NO.19 TELETYPE MACH.	NO. 14 REPERFORATORS	