NAVELEX 0967-390-4010

VOLUME I

SYSTEM TECHNICAL MANUAL

FOR

PROJECT CLARINET

ADA, BETH, AND CINDY MICROWAVE SYSTEM

DEPARTMENT OF THE NAVY

NAVAL ELECTRONICS SYSTEMS COMMAND

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PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
Volume I		Volume II	
Title Page	Original	Title Page	Original
ii to xiv	Original	ii to vi	Original
1-0 to 1-133	Original	5-1 to 5-403	Original
2-1 to 2-29	Original	6-1 to 6-68	Original
3-1 to 3-51	Original		
4-1 to 4-37	Original		
i-1 to i-4	Original		

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TABLE OF CONTENTS

TABLE OF CONTENTS (CONT)

TABLE OF CONTENTS (CONT)

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (CONT)

LIST OF ILLUSTRATIONS (CONT)

LIST OF ILLUSTRATIONS (CONT)

LIST OF TABLES

LIST OF TABLES (CONT)

INTRODUCTION

This manual provides information for the operation and maintenance of the Project Clarinet Ada, Beth, and Cindy Microwave System in the United Kingdom (Scotland and Northern Ireland). This voice frequency microwave system serves as an intercommunication link between the following sites: Thurso, Latheron, Mormond Hill, Aberdeen, Inverbervie, Kinnaber, Edzell, Craigowl Hill, East Lomond, Kirk O'Shotts, Sergeant Law, Brown Carrick, Slieveanorra, Dungiven, and Londonderry.

This manual gives complete coverage to the items of equipment peculiar to the system and not covered in related publications. The items of equipment covered in these related manuals are mentioned herein to show equipment interrelationship. The following manuals contain information pertaining to the Ada, Beth, and Cindy Microwave System.

55E22E-( )MW Receiver Subsystem
- MS-01 Maintenance Standards
- PS-01 Performance Standards
- Maintenance Index Page

55E22C-( )MW Transmitter Subsystem
- MS-02 Maintenance Standards
- PS-02 Performance Standards
- Maintenance Index Page

55F30A-( )MW Receiver Subsystem
- MS-03 Maintenance Standards
- PS-03 Performance Standards
- Maintenance Index Page

65F1A-( )MW Transmit Converter Subsystem
- MS-04 Maintenance Standards
- PS-04 Performance Standards
- Maintenance Index Page

50F11-( )MW TWT Power Amplifier Subsystem
- MS-05 Maintenance Standards
- PS-05 Performance Standards
- Maintenance Index Page

35A1-MW FM Transmitter Subsystem
- MS-06 Maintenance Standards
- PS-06 Performance Standards

90E2-MW (Modified) 1:1 IF. Switch Subsystem
- MS-07 Maintenance Standards
- PS-07 Performance Standards

90C2-MW (Modified) Diversity Subsystem
- MS-08 Maintenance Standards
- PS-08 Performance Standards
- Maintenance Index Page

99G2-MW Coupling Subsystem
- MS-09 Maintenance Standards
- PS-09 Performance Standards

90A1-MX Audio Service Channel
- MS-10 Maintenance Standards
- PS-10 Performance Standards
- Maintenance Index Page

FA-102 Fault Alarm Receiver Set
- MS-11 Maintenance Standards
- PS-11 Performance Standards
- Maintenance Index Page

FA-102 Fault Alarm Data Transmitter
- MS-12 Maintenance Standards
- PS-12 Performance Standards
- Maintenance Index Page

Technical Control Equipment and Miscellaneous Units
- MS-13 Maintenance Standards
- PS-13 Performance Standards

Antenna Set
- MS-14 Maintenance Standards
- PS-14 Performance Standards
- Maintenance Index Page

Commercial Equipment Manuals
- NAVELEX 0967-385-3010, MW-508D Remodulating Microwave System
- NAVELEX 0967-385-4010, MW-509E Heterodyne Microwave System
- NAVELEX 0967-385-5010, 90C2-MW Diversity Subsystem and 90E2-MW 1:1 IF. Switch Subsystem
- NAVELEX 0967-385-6010, FA-102 Fault Alarm System
- NAVELEX 0967-385-7010, 90A1-MX Audio Service Channel
- NAVELEX 0967-385-8010, 99G2-MW Coupling Subsystem
- NAVELEX 0967-385-9010, Technical Control Equipment and Miscellaneous Units
- NAVSHIPS 0967-337-7180, AN/UCC-4 Multiplexer Set, Service
- NAVSHIPS 0967-337-7190, AN/UCC-4 Multiplexer Set, Circuit Diagrams

This manual consists of six sections containing the following information: section 1, general information and reference tables; section 2, installation information and plant-in-place drawings; section 3, operating instructions; section 4, troubleshooting procedures and functional descriptions; section 5, maintenance data and diagrams; and section 6, parts list. An alphabetical index follows the parts list. The preparation of this manual, the abbreviations, symbols, and descriptions used are in accordance with the following specifications and standards.

MIL-D-1000/2	Drawings, Engineering and Associated Lists
MIL-M-15071F (SHIPS)	Manuals, Equipment and Systems
MIL-STD-12C	Abbreviations for Use on Drawings and in Technical-Type Publications
USAS Y14.15	Electrical Diagrams
USAS Y32.2	Electrical and Electronics Diagram, Graphic Symbols for
USAS Y32.16	Electrical and Electronics Reference Designations
NAVSHIPS 94500	Preparation Guide for Electronic Equipment Technical Manuals

GLOSSARY

Terms used in this manual are specially defined as follows:

BASEBAND: The term baseband refers to a signal that contains intelligence to be transmitted by the microwave system. The signal may consist of data, video, or audio information. When the microwave system is used to transmit multiplex voice information, the baseband may consist of voice channel signals, signaling tones, and pilot signals in the 300-Hz to 10-MHz spectrum. The portion of this spectrum used by the Project Clarinet Ada-Beth-Cindy Microwave System is from 300 Hz to 1500 kHz.

CONFIGURATION: A configuration is a given mechanical and electrical arrangement of microwave equipment. One or more such configurations (identical or different) may be used at a given station.

dB (DECIBEL): In this manual, dB is used as a unit of measurement for ac signal levels. The unit refers to the indication obtained on the dB scale of an ac voltmeter calibrated to indicate 0 dB when 0.775 volt rms is applied to the meter.

Any voltage can be expressed in dB relative to 0.775 volt according to this relationship:

$$dB = 20 \log_{10} \frac{\text{voltage}}{0.775}$$

dBm (DECIBEL, REFERENCED TO 1 MILLIWATT): In this manual, dBm is used as a unit of power measurement. Zero dBm exists in a circuit when the square of the applied voltage divided by the impedance of the circuit equals 1 milliwatt. Thus dBm may be read directly from a voltmeter scale only when the impedance of the circuit and the impedance for which the meter scale is calibrated are the same. Many meters are calibrated to indicate 0 dBm when 0.775 volt exists across a 600-ohm load:

$$\frac{(0.775 \text{ volt})^2}{600 \text{ ohms}} = \frac{0.600625 \text{ volt}}{600 \text{ ohms}} \approx 0.001 \text{ watt} =$$

1 milliwatt

Some meters have an input impedance selector and/or a scale that indicates 0 dBm when 0.274 volt exists across 75 ohms:

$$\frac{(0.274 \text{ volt})^2}{75 \text{ ohms}} = \frac{0.075076 \text{ volt}}{75 \text{ ohms}} \approx 0.001 \text{ watt} =$$

1 milliwatt

When the meter-calibration impedance is known, the equivalent dBm value can be calculated for any load impedance:

dBm correction factor =

$$10 \log_{10} \frac{\text{meter-calibration impedance}}{\text{load impedance}}$$

Thus, if a meter calibration is for 600 ohms and the measurement is to be taken in a 75-ohm circuit, the correction factor is:

dBm correction factor =

$$10 \log_{10} \frac{600 \text{ ohms}}{75 \text{ ohms}} = 10 \log_{10} 8 \approx 9 \text{ dB}$$

Thus, a meter calibrated for a 600-ohm impedance indicates -9 dB (0.274 volt) when 1 milliwatt of power is applied to a 75-ohm load. Since the dBm unit is a power ratio, a meter calibrated for a 600-ohm impedance indicates 9 dB low across a 75-ohm load at any signal level. Thus, the dB indication of the meter may be converted to dBm by adding 9 dB;

A meter calibrated to indicate 0 dBm with 0.775 volt across 600 ohms, indicates -42 dB across a 75-ohm load. What is the equivalent dBm value?

-42 dB
+ 9 dB
-33 dBm

HETERODYNE EQUIPMENT: Collins heterodyne equipment (509E series) uses a 70-MHz signal, frequency modulated by the baseband, as the input signal to the transmitter and the output

signal of the receiver. At repeaters, the 70-MHz fm output of a receiver is applied directly to a transmitter for retransmission. Separate equipment is normally required to convert the baseband input signal to a 70-MHz fm output frequency modulated signal for application to the transmitter and to convert the 70-MHz fm output of the receiver into a baseband output. This separate equipment consists of a frequency modulation transmitter (fmt) and a frequency modulation receiver (fmr) that together compose a frequency modulation terminal. This equipment is not required at sites where there is no input baseband signal, such as a heterodyne repeater.

REMODULATING EQUIPMENT: Collins remodulating equipment (508D series) uses a baseband signal as the input signal to the transmitter and the output signal of the receiver. At repeaters, the baseband signal output of a receiver is reapplied to a transmitter to frequency modulate the transmitter carrier.

DIVERSITY: In a frequency diversity application, identical intelligence is transmitted over two parallel paths at different frequencies. The two received signals are combined to yield an overall improvement of the signal quality. This method requires duplicate radio equipment, but a single antenna may be used at both the transmit and the receive station. In quadruple diversity application, two rf signals of different frequencies are transmitted from a single antenna, but are received on two antennas. The overall purpose of diversity operation is to increase transmission reliability by compensating for path fading because of propagation characteristics.

MODULE: A module is an electrical assembly mechanically mounted to form a single detachable unit. A plug-in module is equipped with connectors that mate with complementary connectors mounted at the rear of a plug-in module shelf (card cage or shelf assembly).

RACK: A rack is an electrical and mechanical arrangement of microwave equipment mounted in a single equipment rack, or in a given side of a double equipment rack.

STATION: A station is a mechanical and electrical arrangement of microwave and ancillary equipment located at a given site and functionally related to a particular microwave system.

SUBSYSTEM: A subsystem is an electrical and mechanical arrangement of modules, connectors, mechanical assemblies, and other related parts that perform an identificable function. A subsystem is normally mounted in a single cabinet or shelf assembly that mounts on an equipment rack. The subsystem requires only external power, signal, and alarm connections to perform its function.

LINK, MICROWAVE: A microwave link is a path or hop between two adjacent communicating microwave terminal or repeater stations. In the Ada-Beth-Cindy Microwave System, there are 15 stations and 14 microwave links.

SYSTEM, MICROWAVE: A microwave system consists of any number of interfaced microwave links. Thus, for the purpose of the manual, the 15 stations of the Project Clarinet Ada-Beth-Cindy Microwave System compose a complete system, even though it is in turn a part of a much larger communication system.

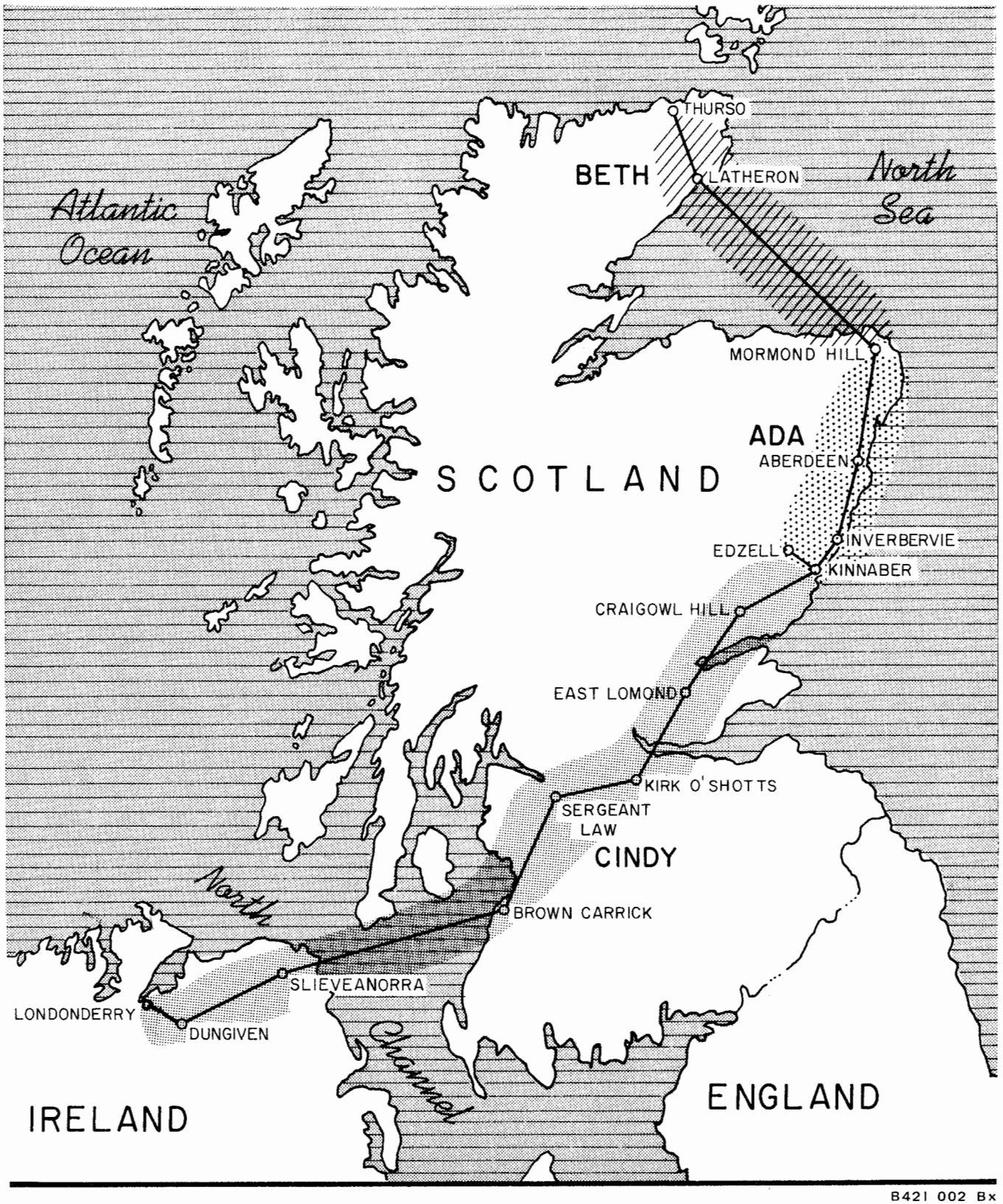


Figure 1-1. Project Clarinet Ada, Beth, and Cindy System Map

SECTION 1

GENERAL INFORMATION

1.1 GENERAL

This section contains a description of the Project Clarinet Ada-Beth-Cindy Microwave System that connects Thurso, Scotland with Londonderry, Ireland (figure 1-1). There are 15 stations (14 microwave links) in the system.

1.2 PURPOSE

The microwave system consists of 14 AN/GRC-169(V) microwave radio groups and 1 existing radio group that interconnect with multiplex equipment at Thurso, Mormond Hill, and Edzell in Scotland, and at Dungiven and Londonderry in northern Ireland. These stations, with the exception of Mormond Hill, are configured as terminal stations. The Mormond Hill station is configured as a repeater station with drops to interface with an existing tropo system in the United Kingdom. Ten additional stations, acting as repeaters only, complete the line-of-sight paths. The Dungiven-Londonderry interconnection is via an existing microwave link.

The system is provided with 12 multiplex channel ends with E & M signaling for 12 channels at Thurso, 12 channel ends with E & M signaling for 12 channels at Edzell, 48 channel ends with no signaling at Dungiven, and 96 channel ends with E & M signaling for 36 channels at Londonderry. Each multiplex terminal has a maximum capacity of 240 voice channels.

1.3 DESCRIPTION OF STATIONS

1.3.1 THURSO STATION

The Thurso station operates as a microwave terminal in a frequency-diversity configuration to link Thurso to Latheron, a distance of 22.7 miles. The station elevation is 82 feet above mean sea level and the antenna is mounted on a 110-foot self-supporting tower 100 feet above ground. The bearing to Latheron is 150° 32' 50" clockwise from true north.

The major equipment supplied for the Thurso station consists of two 1-watt remodulating transmitter subsystems, two remodulating receiver subsystems, one diversity subsystem, one audio service channel, one fault alarm transmitter, one coupling subsystem, one signaling/termination set, one circuit patch bay, one vf patch bay, one dc battery plant, and one antenna set. Government-furnished AN/UCC-4 voice multiplex equipment is used to establish the required system channelization. All the major equipment is located in the MDF (main distribution frame) room of the Naval radio transmitter building except for the antenna and exterior waveguide system.

1.3.2 LATHERON STATION

The station at Latheron is configured as a repeater. This station uses frequency-diversity for the link between Latheron and Thurso, a distance of 22.7 miles, and quadruple-diversity for the over-water link between Latheron and Mormond Hill, a distance of 69.9 miles. The station elevation is 933 feet above mean sea level and the antennas are mounted on a 360-foot guyed steel tower. The antenna for the Latheron-Thurso link is mounted 45 feet above ground at a bearing of 330° 48' 32" from true north. The two antennas for the Latheron-Mormond Hill link are mounted 190 feet and 350 feet above ground. The bearing to Mormond Hill is 134° 41' 16" from true north.

The major equipment supplied for the Latheron station consists of four 1-watt remodulating transmitter subsystems, six remodulating receiver subsystems, two twt amplifier subsystems, three diversity subsystems, two coupling subsystems, one fault alarm transmitter, one audio service channel, one dc power plant, one emergency generator plant, one antenna set, and two shelters. All the major equipment, except for the antenna and exterior waveguide equipment, is located in the transportable shelters.

1.3.3 MORMOND HILL STATION

The Mormond Hill station is configured as a repeater with drop and insertion capabilities. This station uses quadruple-diversity for the over-water link between Mormond Hill and Latheron, a distance of 69.9 miles, and frequency-diversity for the link between Mormond Hill and Aberdeen, a distance of 36.7 miles. The station elevation is 745 feet above mean sea level and the antennas are mounted on a 360-foot guyed steel tower. The two antennas for the Mormond Hill-Latheron link are mounted 190 feet and 350 feet above ground. The bearing to Latheron is 315° 49' 31" from true north. The antenna for the Mormond Hill-Aberdeen link is mounted 190 feet above ground at a bearing of 188° 15' 32" from true north.

The major equipment supplied for the Mormond Hill station consists of four 1-watt remodulating transmitter subsystems, six remodulating receiver subsystems, two twt amplifier subsystems, three diversity subsystems, two coupling subsystems, one fault alarm transmitter, one audio service channel, one dc power plant, and one antenna set. All the major equipment, except for the antenna and exterior waveguide, is located in the microwave equipment room of the Air Force North Atlantic Radio Station Composite Building.

1.3.4 ABERDEEN STATION

The station at Aberdeen operates as a heterodyne repeater in a frequency-diversity configuration. The Aberdeen to Mormond Hill link is 36.7 miles and the Aberdeen to Inverbervie link is 15.8 miles. The station elevation is 543 feet above mean sea level and the antennas are mounted on a 30-foot self-supporting tower. The antenna for the Aberdeen-Mormond Hill link is mounted 25 feet above ground level at a bearing of 8° 8' 26" from true north. The antenna for the Aberdeen-Inverbervie link is mounted 15 feet above ground level at a bearing of 191° 47' 22" from true north.

The major equipment supplied for the Aberdeen station consists of four receiver subsystems, four transmit converter subsystems, four 5-watt twt amplifier subsystems, a fault alarm transmitter, an audio service channel, one dc power plant, one emergency generator plant, one antenna set, and two shelters. All the major equipment, except for the antennas and exterior waveguide equipment, is located in the transportable shelters.

1.3.5 INVERBERVIE STATION

The Inverbervie station operates as a heterodyne repeater in a frequency-diversity configuration. The link from Inverbervie to Aberdeen is 15.8 miles and the Inverbervie-Kinnaber link is 9.9 miles. The station elevation is 455 feet above mean sea level and the antennas are mounted on a 100-foot guyed steel tower. The antenna for the Inverbervie-Aberdeen link is mounted 45 feet above ground level at a bearing of 11° 43' 4" from true north, and the antenna for the Inverbervie-Kinnaber link is mounted 95 feet above ground level at a bearing of 222° 39' 12" from true north.

The major equipment supplied for the Inverbervie station consists of four receiver subsystems, four transmit converter subsystems, four 5-watt twt amplifier subsystems, one fault alarm transmitter, one audio service channel, one dc power plant, one emergency generator plant, one antenna set, and two shelters. All the major equipment, except for the antennas and exterior waveguide equipment, is located in the transportable shelters.

1.3.6 KINNABER STATION

The Kinnaber station is configured as a 3-way junction repeater. Remodulating, frequency diversity equipment is used for the links between Kinnaber and Inverbervie and between Kinnaber and Edzell. Heterodyne, frequency-diversity equipment is used for the link between Kinnaber and Craigowl Hill. The Kinnaber-Inverbervie link is 9.9 miles, the Kinnaber-Edzell link is 7.7 miles, and the Kinnaber-Craigowl Hill link is 25.8 miles. The station elevation is 15 feet above mean sea level and the antennas are mounted on a 190-foot guyed steel tower. The antenna for the Kinnaber-Inverbervie link is mounted 185 feet above ground at a bearing of 42° 30' 20" from true north; the antenna for the Kinnaber-Edzell link is mounted 180 feet above ground at a bearing of 304° 43' 30" from true north; and the antenna for the Kinnaber-Craigowl Hill link is mounted 125 feet above ground at a bearing of 238° 40' 27" from true north.

The major equipment supplied for the Kinnaber station consists of two heterodyne transmit-converter subsystems, one dual fm transmitter subsystem, two twt amplifier subsystems, two heterodyne receiver subsystems, four 1-watt

remodulating transmitter subsystems, four remodulating receiver subsystems, three diversity subsystems, three coupling subsystems, a fault alarm transmitter, one audio service channel, a dc power plant, and an antenna set. All the major equipment, except for the antennas and exterior waveguide equipment, is located in an existing building.

1.3.7 EDZELL STATION

The Edzell station operates as a microwave terminal in a frequency-diversity configuration to link Edzell to Kinnaber, a distance of 7.7 miles. The station elevation is 150 feet above mean sea level and the antenna is mounted on an 80-foot self-supporting tower. The antenna is 75 feet above ground level and the bearing to Kinnaber is 124° 35' 6" from true north.

The major equipment supplied for the Edzell station consists of two remodulating receiver subsystems, two remodulating 1-watt transmitter subsystems, one diversity subsystem, one coupling subsystem, a fault alarm transmitter, one audio service channel, one sf signaling bay, one circuit patch bay, one vf patch bay, a dc power plant, one antenna set, and one shelter. Government-furnished AN/UCC-4 voice multiplex equipment is used to establish the required system channelization. All the major equipment is located in the transportable shelter except for the antenna and exterior waveguide equipment.

1.3.8 CRAIGOWL HILL STATION

The station at Craigowl Hill is configured as a frequency-diversity heterodyne repeater. The Craigowl Hill to Kinnaber link is 25.8 miles and the Craigowl Hill to East Lomond link is 22.5 miles. The station elevation is 1,485 feet above mean sea level and the antennas are mounted on a 20-foot wooden tower. The antenna for the Craigowl Hill-Kinnaber link is mounted 18 feet above ground level at a bearing of 57° 42' 22" from true north. The antenna for the Craigowl Hill-East Lomond link is mounted 18 feet above ground level and has a bearing of 199° 14' 8" from true north.

The major equipment supplied for the Craigowl Hill station consists of four receiver subsystems, four transmit-converter subsystems, four twt amplifier subsystems, a fault alarm transmitter, one audio service channel, one dc power plant, one antenna set, and two shelters. All the major equipment, except for the antennas and exterior waveguide equipment, is located in the transportable shelters.

1.3.9 EAST LOMOND STATION

The East Lomond station is a frequency-diversity heterodyne repeater. The East Lomond to Craigowl Hill link is 22.5 miles and the East Lomond to Kirk O'Shotts link is 36.0 miles. The station elevation is 1,075 feet above mean sea level and the antennas are mounted on a 60-foot self-supporting steel tower. The antenna for the East Lomond-Craigowl Hill link is 30 feet above ground at a bearing of 19° 4' 28" from true north. The antenna for the East Lomond-Kirk O'Shotts link is 50 feet above ground and has a bearing of 221° 52' 10" from true north.

The major equipment supplied for the East Lomond station consists of four receiver subsystems, four transmit-converter subsystems, four 5-watt twt amplifier subsystems, a fault alarm transmitter, one audio service channel and combining network, one dc power plant, one emergency generator plant, one antenna set, and two shelters. All the major equipment, except for the antennas and exterior waveguide equipment, is located in the transportable shelters.

1.3.10 KIRK O'SHOTTS STATION

The station at Kirk O'Shotts is configured as a frequency-diversity heterodyne repeater. The Kirk O'Shotts to East Lomond link is 36.0 miles and the Kirk O'Shotts to Sergeant Law link is 24.9 miles. The station elevation is 925 feet above mean sea level and the antennas are mounted on a 100-foot self-supporting steel tower. The antenna for the Kirk O'Shotts-East Lomond link is mounted 90 feet above ground at a bearing of 41° 21' 22" from true north. The Kirk O'Shotts-Sergeant Law antenna is mounted 90 feet above ground at a bearing of 263° 11' 6" from true north.

The major equipment supplied for the Kirk O'Shotts station consists of four receiver subsystems, four transmit-converter subsystems, four 5-watt twt amplifier subsystems, a fault alarm transmitter, one audio service channel and combining network, one dc power plant, one emergency generator plant, one antenna set, and

two shelters. All the major equipment, except for the antennas and exterior waveguide equipment, is located in the transportable shelters.

1.3.11 SERGEANT LAW STATION

The Sergeant Law station operates as a heterodyne repeater in a frequency-diversity configuration. The Sergeant Law to Kirk O'Shotts link is 24.9 miles and the Sergeant Law to Brown Carrick link is 28.9 miles. The station elevation is 730 feet above mean sea level and the antennas are mounted on a 150-foot self-supporting steel tower. The antenna for the Sergeant Law-Kirk O'Shotts link is mounted 30 feet above ground at a bearing of 82° 39' 28" from true north. The antenna for the Sergeant Law-Brown Carrick link is mounted 145 feet above ground at a bearing of 198° 43' 49" from true north.

The major equipment supplied for the Sergeant Law station consists of four receiver subsystems, four transmit-converter subsystems, four 5-watt twt amplifier subsystems, a fault alarm transmitter, one audio service channel and combining network, one dc power plant, one emergency generator plant, one antenna set, and two shelters. All the major equipment, except for the antennas and exterior waveguide equipment, is located in the transportable shelters.

1.3.12 BROWN CARRICK STATION

The station at Brown Carrick is configured as a heterodyne repeater. This station uses frequency diversity for the Brown Carrick to Sergeant Law link and quadruple diversity for the over-water link to Slieveanorra. The Brown Carrick-Sergeant Law link is 28.9 miles and the link between Brown Carrick and Slieveanorra is 64.2 miles. The station elevation is 902 feet above mean sea level and the antennas are mounted on a 130-foot self-supporting tower. The antenna for the Brown Carrick-Sergeant Law link is mounted 120 feet above ground at a bearing of 18° 32' 5" from true north. The antennas for the Brown Carrick-Slieveanorra link are mounted 124 feet and 120 feet 3-1/2 inches above ground. The bearing to Slieveanorra is 249° 26' 32" from true north.

The major equipment supplied for the Brown Carrick station consists of six receiver subsystems, four transmit-converter subsystems, four 5-watt twt amplifier subsystems, two if. switching subsystems, one fault alarm transmitter, one audio service channel and combining network, one dc power plant, one emergency generator plant, one antenna set, and two shelters. All the major equipment, except for the antennas and exterior waveguide equipment, is located in the transportable shelters.

1.3.13 SLIEVEANORRA STATION

The Slieveanorra station is a heterodyne repeater that uses quadruple diversity for the Slieveanorra to Brown Carrick over-water link and frequency diversity for the link between Slieveanorra and Dungiven. The Slieveanorra-Brown Carrick link is 64.2 miles and the Slieveanorra-Dungiven link is 26.6 miles. The station elevation is 1,671 feet above mean sea level and the antennas are mounted on a 70-foot self-supporting tower. The antennas for the Slieveanorra-Brown Carrick link are mounted 64 feet and 48 feet 9-3/8 inches above ground at a bearing of 68° 11' 36" from true north. The antenna for the Slieveanorra-Dungiven link is mounted 20 feet above ground at a bearing of 249° 12' 18" from true north.

The major equipment supplied for the Slieveanorra station consists of six receiver subsystems, four transmit converter subsystems, four 5-watt twt amplifier subsystems, two if. switching subsystems, a fault alarm transmitter, one audio service channel and combining network, one dc power plant, one emergency generator plant, one antenna set, and two shelters. All the major equipment is located in the transportable shelters except for the antennas and exterior waveguide equipment.

1.3.14 DUNGIVEN STATION

The Dungiven station operates as a heterodyne terminal in a frequency-diversity configuration to link Dungiven with Slieveanorra, a distance of 26.6 miles. An existing microwave link connects Dungiven with Londonderry. The elevation at the Dungiven station is 1,309 feet above mean sea level and the antenna for the Dungiven-Slieveanorra link is mounted on an existing 200-foot self-supporting tower. The antenna is 30 feet above ground level at a bearing to Slieveanorra of 68° 41' 30" from true north.

The major equipment supplied for the Dungiven station consists of two heterodyne

transmit-converter subsystems, two twt amplifier subsystems, one dual fm transmitter subsystem, two receiver subsystems, one diversity subsystem, three coupling subsystems, a fault alarm transmitter, an audio service channel, one 4-way 4-wire bridge, one circuit patch bay, one vf patch bay, a dc power plant, and an antenna set. Government-furnished AN/UCC-4 voice multiplex equipment is used to establish the required system channelization. All the major equipment is located in an existing equipment van except for the antenna, exterior waveguide equipment, and dc power plant. The dc power plant is located in an adjacent, separate power building.

1.3.15 LONDONDERRY STATION

The Londonderry station is an existing terminal that is connected to Dungiven by an existing microwave link. Londonderry serves as the master fault-monitoring station for the entire system. All other stations report failure alarms to this station.

The major equipment supplied for the Londonderry station consists of a fault alarm receiver set, one sf signaling bay, one circuit patch bay, and one vf patch bay. Government-furnished AN/UCC-4 multiplex equipment establishes the required system channelization.

1.4 DESCRIPTION OF MAJOR EQUIPMENT

1.4.1 53E22C-( )MW TRANSMITTER SUBSYSTEM

The 53E22C-( )MW Transmitter Subsystem is part of the Collins 508D series of remodulating microwave equipment. This subsystem accepts a baseband signal input that may contain voice, data, or video information. This type of transmitter subsystem amplifies the baseband signal which then frequency modulates a klystron-generated carrier, operating at the assigned frequency. The nominal 1-watt output from the subsystem is applied to the antenna for transmission. Frequency control is maintained by an afc loop.

The transmitter subsystem is contained in a 17-inch cabinet assembly that mounts in a 19-inch equipment rack. The cabinet assembly is provided with a removable front cover. The 53E22C-( )MW contains a transmitter waveguide assembly mounted on a standoff chassis and a 7-inch card cage. An afc reference unit is mounted on the waveguide assembly. The card cage contains a slide-mounted klystron power and control unit and plug-in modulation amplifier and afc modules. Except for primary power, all necessary operating voltages, controls, coupling networks, and metering circuits are provided in the subsystem.

1.4.2 65F1A-( )MW TRANSMIT CONVERTER SUBSYSTEM

The 65F1A-( )MW Transmit Converter Subsystem is part of the Collins 509E series of heterodyne microwave equipment. This subsystem accepts a 70-MHz fm signal and mixes it with the output from a solid-state local oscillator to obtain a modulated microwave signal. This output signal is then coaxially coupled to a 5-watt twt amplifier subsystem for transmission. The subsystem also accepts order-wire and fault alarm audio signals. These signals are mixed and up-converted in the local oscillator.

The transmit converter subsystem is contained in a 17-inch cabinet assembly that mounts in a 19-inch equipment rack. The cabinet assembly is provided with a removable front cover. The 65F1A-( )MW contains a waveguide tray assembly and a 7-inch card cage. Mounted in the tray assembly is a 70-MHz amplifier and a solid-state local oscillator. Mounted in the card cage are a slope equalizer/pad, the transmit power and control unit, and an off-frequency alarm unit. Except for primary power, the subsystem provides all necessary control switches, metering circuits, coupling networks, and operating voltages.

1.4.3 55E22E-( )MW RECEIVER SUBSYSTEM

The 55E22E-( )MW Receiver Subsystem is part of the Collins 508D series of remodulating microwave equipment. This type of receiver subsystem converts a received microwave signal into a 70-MHz if. signal, then amplifies and demodulates the 70-MHz signal to recover the baseband intelligence. The baseband information can then be either coupled to associated multiplex equipment or be remodulated onto a new microwave carrier for transmission.

The receiver subsystem is contained in a 17-inch cabinet assembly that mounts in a 19-inch equipment rack. The cabinet assembly is provided with a removable front cover. The 55E22E-( )MW contains a receiver waveguide assembly mounted

on a standoff chassis and a 7-inch card cage. A solid-state local oscillator and microstrip mixer-amplifier are mounted on the waveguide assembly. Transistorized, etched circuit, plug-in modules and a combination power supply and control unit are mounted in the card cage. Except for primary power, all necessary operating voltages, controls, coupling networks, and metering circuits are provided in the subsystem.

1.4.4 55F30A-( )MW RECEIVER SUBSYSTEM

The 55F30A-( )MW Receiver Subsystem is part of the Collins 509E series of heterodyne microwave equipment. This type of receiver subsystem converts a received microwave signal to a 70-MHz if. signal and amplifies the 70-MHz signal for application to an fm terminal subsystem for demodulation, or to a transmit converter subsystem for retransmission.

The receiver subsystem is contained in a 17-inch cabinet assembly that mounts in a 19-inch equipment rack. A removable front cover is provided for the assembly. The 55F30A-( )MW contains a receiver waveguide assembly in a slide-mounted drawer assembly and a 7-inch card cage. A solid-state local oscillator and a microstrip mixer/amplifier are mounted on the waveguide assembly. Transistorized, etched circuit, plug-in modules and a combination power supply and control unit are mounted in the card cage. A jackfield panel between the card cage and the drawer assembly provides inter-unit if. connections for subsystem operation and maintenance tests. The necessary operating voltages, controls, coupling networks, and metering circuits are provided in the subsystem.

1.4.5 50F11-( )MW TWT POWER AMPLIFIER SUBSYSTEM

The 50F11-( )MW twt amplifier subsystem is used to amplify frequency-modulated carrier signals from an associated transmitter or transmit converter subsystem to a 5-watt output level for transmission.

The 50F11-( )MW is contained in a 17-inch cabinet assembly that mounts in a 19-inch equipment rack. The cabinet assembly is equipped with a removable front cover. The subsystem cabinet contains a chassis-mounted power supply and control unit and sliding drawer assembly. Within the drawer assembly is a twt, a power monitor unit, and a waveguide assembly. Except for primary power, all necessary operating voltages for the twt and the power monitor are provided by the power supply and control unit.

1.4.6 90C2-MW DIVERSITY SUBSYSTEM (MODIFIED)

The 90C2-MW Diversity Subsystem combines the baseband outputs of two microwave receivers into a single baseband output to improve system reliability and signal-to-noise (s/n) ratio. An improvement of up to 3 dB over a non-diversity path is possible. This subsystem is normally used with remodulating microwave equipment.

The 90C2-MW is contained in a 17-inch cabinet assembly that mounts on a 19-inch equipment rack. The cabinet assembly is equipped with a removable front cover. Within the cabinet is a 7-inch-high wired panel assembly that contains 11 transistorized, etched circuit, plug-in modules. These modules consist of two power regulators, two diversity combiners, two pilot converters, two pilot/noise sensors, one control unit, one alarm unit, and one pilot oscillator. Besides these modules, either one or two pilot stop filters are mounted on the back of the assembly.

1.4.7 90E2-MW 1:1 IF. SWITCH SUBSYSTEM

The 90E2-MW IF. Switch Subsystem senses the baseband outputs of two heterodyne microwave receivers and selects the rf channel with the better signal-to-noise ratio. The if. output of the selected receiver (70 MHz) is then switched to the output of the 90E2-MW and the if. of the unused receiver is terminated.

The 90E2-MW is contained in a 17-inch cabinet assembly that mounts on a 19-inch equipment rack. The cabinet assembly is equipped with a removable front cover. Within the cabinet assembly is a jackfield and a 7-inch-high panel assembly that contains transistorized, etched circuit, plug-in modules. These modules consist of a control unit, a comparator, a diode switch, two pilot converters, pilot/noise sensors, a power splitter, and power regulators or converters.

1.4.8 99G2-MW COUPLING SUBSYSTEM

The 99G2-MW Coupling Subsystem interconnects the incoming and outgoing baseband signals of the microwave and multiplex equipment. The subsystem simply matches the levels and impedances of the two equipments.

The 99G2-MW is contained in a 17-inch cabinet assembly that mounts in a 19-inch equipment rack. The cabinet assembly is equipped with a removable front cover. The subsystem cabinet assembly contains a 7-inch card cage in which transistorized etched circuit plug-in modules are mounted. The number and types of modules depend on the specific application.

1.4.9 90A1-MX AUDIO SERVICE CHANNEL

The 90A1-MX Audio Service Channel provides a party-line voice frequency channel between microwave stations that is independent of any multiplex channels. This audio channel is primarily used for maintenance, test, and adjustment purposes.

The 90A1-MX is a wired, hinged equipment shelf that mounts five transistorized, etched circuit, plug-in modules and a module extender. Removable dust covers on the equipment shelf provide access to the modules and to the wiring on the rear of the shelf. The equipment shelf mounts on a 19-inch equipment rack. The plug-in modules consist of a termination unit, a modulator, a demodulator, and audio amplifier, and an oscillator.

1.4.10 35A1-( )MW FM TRANSMITTER SUBSYSTEM

The 35A1-( )MW FM Transmitter Subsystem generates a 70-MHz signal that is frequency modulated by baseband information. The modulated 70-MHz signal is applied to an associated transmit converter subsystem for translation to microwave frequencies.

The 35A1-( )MW is contained in a 17-inch cabinet assembly that mounts in a 19-inch equipment rack. The cabinet assembly is equipped with a removable front cover. Within the cabinet assembly is a jackfield and a 7-inch card cage. The card cage mounts the transistorized, etched circuit, plug-in modules for the subsystem. The card cage has the capacity to contain modules for two fm transmitter (fmt) subsystems. The plug-in modules are an attenuator pad, an fm generator, an afc unit, and a power regulator or converter.

1.4.11 FA-102 DATA TRANSMITTER (FAULT ALARM)

The FA-102 Data Transmitter is used to transmit equipment status and/or condition information to the supervisory terminal in the microwave system via the microwave rf equipment. Any type of status and/or condition can be transmitted. Typical conditions or situations are battery charger failure, primary power failure, shelter entry, tower light failure, equipment failure, shelter ambient temperature alarm, or any significant electrical change of state. One data transmitter is capable of sensing up to 17 different alarm conditions or situations.

The data transmitter consists of two card cages that are mounted on 19-inch equipment racks. Each card cage occupies two vertical mounting spaces on the rack. Transistorized, etched circuit, plug-in modules that contain the active circuits and controls are mounted in the two card cages. The types of modules used are register and data indicator, shift pulse generator, transmitter control unit, register and indicator tester, and a tone oscillator.

1.4.12 FAULT ALARM RECEIVER SET

The fault alarm receiver set is used at the supervisory terminal to report equipment status and/or conditions at the various stations in the microwave system. The fault alarm data is transmitted to the supervisiory terminal by the associated microwave rf equipment. The fault alarm receiver set contains a fault alarm control panel, an FA-102 Data Receiver, and a major alarm and local indicator unit.

The fault alarm control panel is a rack-mounted panel assembly that contains a transistorized, etched circuit board, and indicator lamps and switches to monitor up to 17 different stations. The control panel monitors all stations at the same time, but will transfer the fault information to the data receiver only when the fault-reporting station is manually selected by a switch on the control panel.

The FA-102 Data Receiver decodes the fault signals transferred to it by the control panel. The data receiver consists of two card cages that are mounted on a 19-inch equipment rack. Transistorized, etched circuit, plug-in modules that contain the active circuits and controls are mounted in these two card cages. The type of modules used are register and data indicator, signal monitor, shift pulse generator, receiver control circuits, tone amplifier and trigger, error indicator, and a coincidence detector.

The major alarm and local indicator unit activates local and major alarms for selected faults at remote stations and for fault conditions at the local or central station. The major alarm and local indicator unit consists of a 19-inch rack-mounted card cage that contains transistorized, etched circuit, plug-in modules. These modules contain the active circuits and controls for the unit. The modules used are a major alarm indicator, data indicator, register and indicator tester, and a major alarm control unit.

1.4.13 TECHNICAL CONTROL EQUIPMENT

The technical control equipment provides the interface connections between the telephone lines, tty, etc, and the government-furnished AN/UCC-4 multiplex equipment. The major divisions of the technical control equipment are the voice frequency and circuit patch bay, the sf signaling equipment, and the combined distribution frame.

1.4.13.1 VOICE FREQUENCY AND CIRCUIT PATCH BAYS

One voice frequency patch bay and one circuit patch bay is provided at each station where AN/UCC-4 multiplex equipment is installed. The patch jacks in the jackfields of each bay are wired to the combined distribution frame (CDF), where they are cross-connected to form the desired circuit configuration.

The vf jacks are connected between the multiplex audio terminals and the circuit conditioning equipment. The vf jacks are connected into the voice circuits with frame jumpers at the CDF. These vf jacks provide a means for testing and patching the individual audio circuits. The test tone levels at the vf jacks are -16 dBm for the modulation inputs and +7 dBm for the demodulation outputs.

The circuit patch jacks are connected between the line conditioning equipment and the circuit drop equipment. All incoming and outgoing vf circuits appear on the circuit patch bay. Each jack circuit consists of a line jack, an equipment jack, and a monitor jack. The circuit patch bay is an equal level patch facility. That is, all circuits that appear on this patch bay have a 0-dBm level.

1.4.13.2 SF SIGNALING EQUIPMENT

The sf signaling equipment is used at multiplex-equipped stations to provide the necessary signaling required by the system. The signaling equipment consists of sf signaling units, signaling oscillators, and line conditioning pad units.

The sf signaling unit is a plug-in module that provides E and M signaling for the carrier equipment. The unit employs in-band signaling to permit use with trunk circuits that meet voice transmission requirements. This type of signaling does not impair normal voice transmission. The E (receiving) and M (transmitting) signals are used for dial and supervisory signaling.

The signaling oscillator generates the 2600-Hz tones that are transmitted by the sf signaling units. These tones are required for the transmission of telephone signaling information between multiplex-equipped stations. The oscillator is a transistorized plug-in module that mounts in a 7-inch card cage.

The line conditioning pad units are used to adjust the channel input/output levels from -16/+7 dBm to 0/0 dBm. The pad units are supplied as plug-in modules that mount in a rack-mounted card cage. Two circuits are contained on each module.

1.4.13.3 COMBINED DISTRIBUTION FRAME

The combined distribution frame is the primary connecting point between the government-furnished multiplex equipment and the microwave radio equipment, and for the voice frequency circuits. Each distribution frame assembly is capable of mounting 18 terminal blocks. These terminal blocks are wired to interconnect the multiplex equipment with the radio equipment and with the vf patch bay and the circuit patch bay.

1.4.14 ANTENNA SET

The antenna set consists of parabolic antennas equipped with heated radomes and antenna mounts, elliptical waveguide, circular waveguide (at two stations only), and automatic waveguide pressurization equipment.

1.4.14.1 PARABOLIC ANTENNAS

Each parabolic antenna has a 6-, 8-, 10-, or 12-foot spun aluminum reflector. Single, polarized feedhorns are used at all stations except for the overwater links. For these links, dual polarized antennas are used. A heated radome covers the concave side of the parabolic reflector as well as the feedhorn. It is conical and is constructed of fiberglass reinforced plastic. The radome prevents accumulation of leaves, sand, and other debris. The spiral heating wire in the radome operates from 120 volts ac and keeps the radome free from ice at freezing temperatures. The heating circuit is controlled by a weatherproof and watertight thermoswitch set to operate the heater between rising and falling temperatures of 25° and 35°F with a 1° differential. The antenna mounts are used to fasten the parabolic antennas to the supporting towers. Each mount is designed to hold a particular size of reflector.

1.4.14.2 ELLIPTICAL WAVEGUIDE

The Heliax elliptical waveguide consists of flexible, corrugated, high-conductivity copper tubing with an elliptical cross section terminated with waveguide transistions to rectangular flanges at each end. For protection during handling and installation, the waveguide is polyethylene jacketed. The waveguide is equipped with tunable sections that are tuned during the installation at each site. Waveguide entry ports with weathertight rubber gasket devices for sealing are used for each station entry. The waveguide is capable of being pressurized up to 10 psig. Appropriate accessories consist of connectors, hanger clamps, angle adapters, feedthrough flanges, and grounding kits.

1.4.14.3 CIRCULAR WAVEGUIDE

At the Latheron and Mormond Hill stations, both elliptical and circular waveguide assemblies are used. The circular waveguide is in a dual-polarized, 330-foot vertical configuration. Elliptical waveguide is used to connect the circular waveguide to the antennas and to the radio equipment.

The circular waveguide consists of heavy-wall, high-conductivity copper tubing and is chromate-conversion coated to prevent corrosion. The waveguide is capable of being pressurized up to 10 psig.

Dual-polarized transitions are used to convert from circular to elliptical waveguide at the ends of the vertical run. The transitions include swivel flanges for easy installation and polarization alignment. An axial ratio compensator is provided at the bottom of the run to adjust the eccentricity of the bottom section to cancel out the axial ratio distortion of the circular waveguide run. An alignment shorting plate is also provided for use during initial alignment.

Rigid, spring, and sliding hangers are used to mount the circular waveguide.

1.4.14.4 WAVEGUIDE PRESSURIZATION EQUIPMENT

The waveguide pressurization equipment consists of a heatless, automatic dehydrator and a distribution manifold. The dehydrator provides a continuous dry air supply for pressurization of the air dielectric transmission lines. The dehydrator is set for a maximum pressure of 8 psig and automatically restarts when the line pressure drops to 3 psig. The dry air output from the dehydrator is distributed to the waveguides through the distribution manifold assembly that provides the required number of pressure outlets. A needle valve and pressure gauge at each outlet provide individual line isolation and pressure reading. The waveguide connections are made from the manifold to each waveguide run using polyethelene tubing. At the stations with shelters, the high-pressure output from the dehydrator is also used to pressurize the deluge shower water tank.

1.4.15 DC POWER PLANT

The dc power plant provides uninterrupted dc power for the station equipment. The power plant uses load-sharing rectifiers for main power and a 48-volt battery bank for standby power. If the rectifiers should fail or if the primary ac input is

lost, the dc power is automatically supplied directly from the batteries. Each rectifier is capable of supplying the microwave load requirements if necessary upon failure of one of the rectifiers.

A complete dc power plant consists of two load-sharing rectifiers/battery chargers, a transistorized counter-emf cell, a low voltage disconnect panel, a fuse and termination panel with ground bar, one set of 24 lead calcium battery cells in battery racks, and a deluge shower. Except for the deluge shower, the dc power plant is mounted in two 19-inch equipment racks (three racks at Kinnaber).

The rectifiers/battery chargers rectify the input ac power to supply a regulated dc output voltage to the station equipment load. At the same time, these units provide a charge to the battery cells to maintain them at full charge. The rectifiers/battery chargers automatically disconnect from the equipment load if the ac power should fail.

The counter emf cell maintains a constant load voltage when a float charge is being applied to the battery cells. The low-voltage disconnect panel is used to remove the battery bank from the load when the voltage drops to a preset level. In an emergency situation, the disconnect panel can be bypassed so the equipment can be operated at a reduced voltage.

The lead-calcium battery cells provide an emergency source of dc power for the station equipment. If necessary, the battery bank can be used for at least 8 hours before the battery voltage decreases below the minimum equipment operating voltage.

The deluge shower is an emergency shower and eyewash fountain equipped with hold-open, hand-operated valves. The water for the deluge shower is contained in a steel 10-gallon storage tank at the shelter stations.

A dc-to-dc inverter is supplied at each station that has AN/UCC-4 multiplex equipment. This inverter provides the 120-volt, 60-Hz power for the frequency generation portion of the multiplex equipment. Normally, the inverter is mounted on the battery charger rack and is powered by the 48-volt battery bank at the station.

1.4.16 EMERGENCY GENERATOR PLANT

The emergency generator plant can provide sufficient power to meet the full load requirements of the station with a 25-percent surplus capacity. The plant contains a water-cooled diesel engine-generator with control panel, an automatic transfer panel, and a fuel supply tank. The primary power service is constantly monitored. If the primary power fails, the generator is started. When the output of the generator reaches 80 percent of the required voltage and frequency, the plant is automatically switched into the line to the dc power plant. When normal power is restored, the generator is removed from the line after a 10-minute test interval. The fuel for the engine-generator is contained in a steel 500-gallon storage tank, located near the generator shelter.

1.5 REFERENCE DATA

1.5.1 EQUIPMENT BREAKDOWN CHART

Figure 1-2 illustrates the breakdown of equipment from the system level to the major subsystem level.

1.5.2 RF PLAN

The Ada-Beth-Cindy Microwave System uses both 1-watt remodulating and 5-watt heterodyne radio sets. Table 1-1 shows the configuration of each station and the type of radio used at each station. Table 1-2 is the system frequency plan including the antenna polarization and antenna diameter.

1.5.3 MULTIPLEX PLAN

Government-furnished AN/UCC-4 voice multiplex equipment in conjunction with Collins technical control equipment is provided at Thurso, Edzell, Dungiven, and Londonderry to establish the required system channelization. The AN/UCC-4 family of equipment is a frequency division multiplex system using single-sideband suppressed-carrier modulation. The technical control equipment contains vf patch bays, sf signaling bays, circuit patch bays, and combined distribution frames. The equipment arrangement used in this system corresponds to the AN/UCC-4 low density carrier configuration.

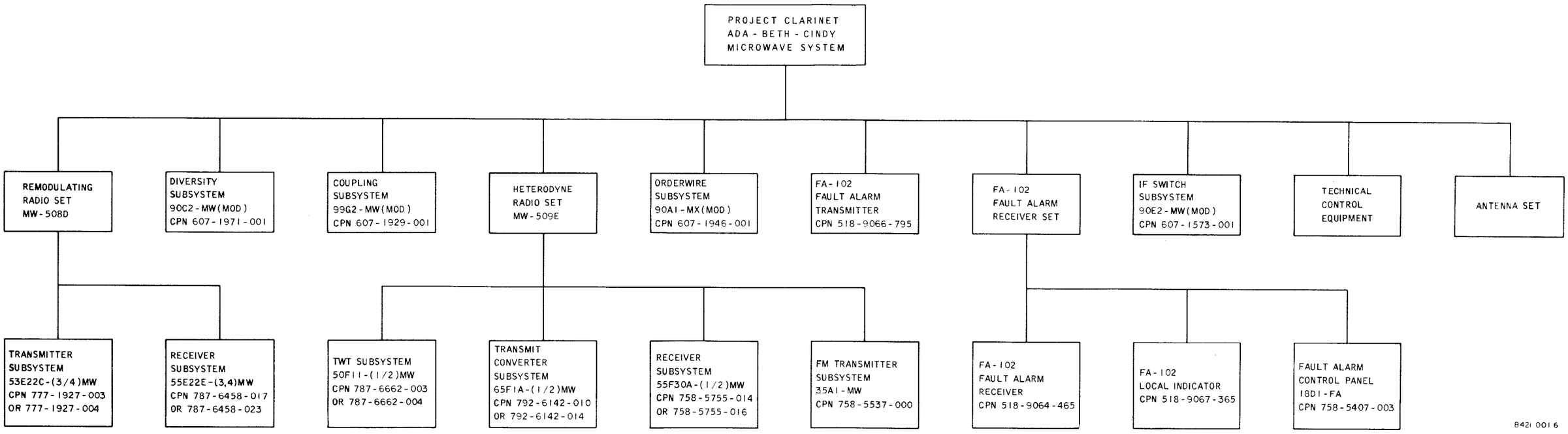


Figure 1-2. Equipment Breakdown Chart

TABLE 1-1. STATION CONFIGURATIONS/RADIO TYPES

STATION	RADIO TYPES		TERMINAL	REPEATER	FREQUENCY DIV	QUAD DIV (SPACE & FREQ)	POWER OUTPUT	
	REMOD (MW-508D)	HET (MW-509E)					1 WATT	5 WATT
Thurso	I		X		X		X	
Latheron	I/II			X	X	X	X	X
Mormond Hill	I/II			X	X	X	X	X
Aberdeen		IIA		X	X			X
Inverbervie		IIA		X	X			X
Kinnaber	I			X	X		X	
		IA		X	X			X
Edzell	I		X		X		X	
Craigowl Hill		IIA		X	X			X
East Lomond		IIA		X	X			X
Kirk O'Shotts		IIA		X	X			X
Sergeant Law		IIA		X	X			X
Brown Carrick		IIA		X	X			X
		IIC		X		X		X
Slieveanorra		IIA		X	X			X
		IIC		X		X		X
Dungiven		IA	X		X			X
Londonderry	*None		X					

* Londonderry terminal connected to Dungiven via existing microwave link. Peripheral equipment is furnished and installed by Collins to complement GFE multiplex equipment.

TABLE 1-2. FREQUENCY PLAN

XMT STATION	RCV STATION	XMT FREQ IN MHz	POLARIZATION	ANT DIA IN FT
Thurso	Latheron	8062.3 7947.5	H H	8
Latheron	Thurso	8112.1 8221.7	H H	8
Latheron	Mormond Hill	8243.7 8127.5	V V	12
Mormond Hill	Latheron	7907.1 8032.3	H H	12
Mormond Hill	Aberdeen	8062.5 7947.7	V V	10
Aberdeen	Mormond Hill	8112.3 8227.1	V V	12
Aberdeen	Inverbervie	8243.1 8127.9	V V	6
Inverbervie	Aberdeen	7907.3 8032.5	V V	6
Inverbervie	Kinnaber	8062.7 7947.1	H H	6
Kinnaber	Inverbervie	8112.5 8227.3	H H	6
Kinnaber	Edzell	8170.0 8234.7	V V	6
Edzell	Kinnaber	7922.1 8047.5	V V	6
Kinnaber	Craigowl Hill	8243.5 8127.1	H H	6
Craigowl Hill	Kinnaber	7907.3 8032.7	H H	6
Craigowl Hill	East Lomond	8062.9 7947.7	V V	6

TABLE 1-2. (Continued)

XMT STATION	RCV STATION	XMT IN MHz	POLARIZATION	ANT DIA IN FT
East Lomond	Craigowl Hill	8112.5 8227.3	V V	6
East Lomond	Kirk O'Shotts	8243.7 8127.3	V V	6
Kirk O'Shotts	East Lomond	7907.5 8032.9	V V	6
Kirk O'Shotts	Sergeant Law	8062.1 7947.9	H H	6
Sergeant Law	Kirk O'Shotts	8112.7 8227.5	H H	6
Sergeant Law	Brown Carrick	8243.9 8127.5	H H	6
Brown Carrick	Sergeant Law	7907.7 8032.1	H H	6
Brown Carrick	Slieveanorra	8062.3 7947.1	V V	12
Slieveanorra	Brown Carrick	8112.9 8227.7	H H	12
Slievenorra	Dungiven	8243.1 8127.7	V V	6
Dungiven	Slieveanorra	7907.9 8032.3	V V	6
*Dungiven	Londonderry	7945.0 8050.0	— —	—
*Londonderry	Dungiven	8125.0 8230.0	— —	—

* Preexisting link.

TABLE 1-3. MULTIPLEX EQUIPMENT

ITEM DESCRIPTION	THURSO	EDZELL	DUNGIVEN	LONDONDERRY
Multiplex Channel Ends (AN/UCC-4)	24	12	48	96
SF Signaling Units (20J2-MX)	12	12	0	36
VF Patch Jack Circuits	60	60	60	96
Circuit Patch Jack Circuits	60	60	60	96
Line Conditioning Pad Units	60	12	60	96
Combined Distribution Frame	1	1	1	1

Refer to table 1-3 for the equipment present at each multiplex terminal and to drawing 610-4309 at the rear of section 5 for a channeling diagram of the system.

1.5.4 PERSONNEL REQUIREMENTS

The following qualifications and training are required for personnel that operate and maintain the microwave equipment in this system:

a. High school graduate or equivalent

b. Graduate of Navy A and/or C training school

c. Not less than 9 months experience on similar or related equipment

1.5.5 REFERENCE TABLES

General reference data is contained in Table 1-1, Station Configurations/Radio Types; Table 1-2, Frequency Plan; Table 1-3, Multiplex Equipment; Table 1-4, Leading Particulars; Table 1-5, Capabilities and Limitations; Table 1-6, Equipment Supplied; and Table 1-7, Test Equipment Required and Supplied. All related publications are listed in the introduction of this manual.

TABLE 1-4. LEADING PARTICULARS

EQUIPMENT	APPROXIMATE WEIGHT IN POUNDS	APPROXIMATE DIMENSIONS IN INCHES			POWER REQUIREMENTS
		WIDTH	HEIGHT	DEPTH	
Thurso Radio Set AN/GRC-169(V)10					42 to 52 volts dc, positive ground
RF Rack	234	20-1/2	84	20	
Ancillary Equipment					42 to 52 volts dc, positive ground
Aux Rack	248	20-1/2	84	20	
Technical Control Equipment					42 to 52 volts dc, positive ground
SF Rack	208	20-1/2	84	20	
Circuit Patch Bay	164	20-1/2	84	20	
VF Patch Bay	162	20-1/2	84	20	
Multiplex Equipment	Refer to Technical Manual for AN/UCC-4 Multiplexer Set				
Latheron Radio Set AN/GRC-169(V)11					42 to 52 volts dc, positive ground
RF Rack 1	234	20-1/2	84	20	
RF Rack 2	313	20-1/2	84	20	

TABLE 1-4. (Continued)

EQUIPMENT	APPROXIMATE WEIGHT IN POUNDS	APPROXIMATE DIMENSIONS IN INCHES			POWER REQUIREMENTS
		WIDTH	HEIGHT	DEPTH	
RF Rack 3	313	20-1/2	84	20	
Ancillary Equipment					42 to 52 volts dc, positive ground
Aux Rack	276	20-1/2	84	20	
Mormond Hill Radio Set AN/GRC-169(V)12					42 to 52 volts dc, positive ground
RF Rack 1	234	20-1/2	84	20	
RF Rack 2	313	20-1/2	84	20	
RF Rack 3	313	20-1/2	84	20	
Ancillary Equipment					42 to 52 volts dc, positive ground
Aux Rack	276	20-1/2	84	20	
Aberdeen Radio Set AN/GRC-169(V)13					42 to 52 volts dc, positive ground
RF Rack 1	506	20-1/2	84	20	
RF Rack 2	506	20-1/2	84	20	

TABLE 1-4. (Continued)

EQUIPMENT	APPROXIMATE WEIGHT IN POUNDS	APPROXIMATE DIMENSIONS IN INCHES			POWER REQUIREMENTS
		WIDTH	HEIGHT	DEPTH	
Ancillary Equipment					42 to 52 volts dc, positive ground
Aux Rack	216	20-1/2	84	20	
Inverbervie Radio Set AN/GRC-169(V)14					42 to 52 volts dc, positive ground
RF Rack 1	234	20-1/2	84	20	
RF Rack 2	234	20-1/2	84	20	
Ancillary Equipment					42 to 52 volts dc, positive ground
Aux Rack	216	20-1/2	84	20	
Kinnaber Radio Set AN/GRC-169(V)15					42 to 52 volts dc, positive ground
RF Rack 1	506	20-1/2	84	20	
RF Rack 2	234	20-1/2	84	20	
RF Rack 3	234	20-1/2	84	20	
Ancillary Equipment					42 to 52 volts dc, positive ground

TABLE 1-4. (Continued)

EQUIPMENT	APPROXIMATE WEIGHT IN POUNDS	APPROXIMATE DIMENSIONS IN INCHES			POWER REQUIREMENTS
		WIDTH	HEIGHT	DEPTH	
Aux Rack 1	216	20-1/2	84	20	
Aux Rack 2	216	20-1/2	84	20	
Edzell Radio Set AN/GRC-169(V)16					42 to 52 volts dc, positive ground
RF Rack	234	20-1/2	84	20	
Ancillary Equipment					42 to 52 volts dc, positive ground
Aux Rack	248	20-1/2	84	20	
Technical Control Equipment					42 to 52 volts dc, positive ground
SF Rack	202	20-1/2	84	20	
Circuit Patch Bay	168	20-1/2	84	20	
VF Patch Bay	166	20-1/2	84	20	
Multiplex Equipment	Refer to Technical Manual for AN/UCC-4 Multiplexer Set				
Craigowl Hill Radio Set AN/GRC-169(V)17					42 to 52 volts dc, positive ground

TABLE 1-4. (Continued)

EQUIPMENT	APPROXIMATE WEIGHT IN POUNDS	APPROXIMATE DIMENSIONS IN INCHES			POWER REQUIREMENTS
		WIDTH	HEIGHT	DEPTH	
RF Rack 1	506	20-1/2	84	20	
RF Rack 2	506	20-1/2	84	20	
Ancillary Equipment					42 to 52 volts dc, positive ground
Aux Rack	216	20-1/2	84	20	
East Lomond Radio Set AN/GRC-169(V)18					42 to 52 volts dc, positive ground
RF Rack 1	506	20-1/2	84	20	
RF Rack 2	506	20-1/2	84	20	
Ancillary Equipment					42 to 52 volts dc, positive ground
Aux Rack	216	20-1/2	84	20	
Kirk O'Shotts Radio Set AN/GRC-169(V)19					42 to 52 volts dc, positive ground
RF Rack 1	506	20-1/2	84	20	
RF Rack 2	506	20-1/2	84	20	

TABLE 1-4. (Continued)

EQUIPMENT	APPROXIMATE WEIGHT IN POUNDS	APPROXIMATE DIMENSIONS IN INCHES			POWER REQUIREMENTS
		WIDTH	HEIGHT	DEPTH	
Ancillary Equipment					42 to 52 volts dc, positive ground
Aux Rack	256	20-1/2	84	20	
Sergeant Law Radio Set AN/GRC-169(V)20					42 to 52 volts dc, positive ground
RF Rack 1	506	20-1/2	84	20	
RF Rack 2	506	20-1/2	84	20	
Ancillary Equipment					42 to 52 volts dc, positive ground
Aux Rack	216	20-1/2	84	20	
Brown Carrick Radio Set AN/GRC-169(V)21					42 to 52 volts dc, positive ground
RF Rack 1	419	20-1/2	84	20	
RF Rack 2	419	20-1/2	84	20	
RF Rack 3	419	20-1/2	84	20	
Ancillary Equipment					42 to 52 volts dc, positive ground

TABLE 1-4. (Continued)

EQUIPMENT	APPROXIMATE WEIGHT IN POUNDS	APPROXIMATE DIMENSIONS IN INCHES			POWER REQUIREMENTS
		WIDTH	HEIGHT	DEPTH	
Aux Rack	236	20-1/2	84	20	
Slieveanorra Radio Set AN/GRC-169(V)22					42 to 52 volts dc, positive ground
RF Rack 1	419	20-1/2	84	20	
RF Rack 2	419	20-1/2	84	20	
RF Rack 3	419	20-1/2	84	20	
Ancillary Equipment	236	20-1/2	84	20	42 to 52 volts dc, positive ground
Aux Rack	236	20-1/2	84	20	
Dungiven Radio Set AN/GRC-169(V)23					42 to 52 volts dc, positive ground
RF Rack	506	20-1/2	84	20	
Ancillary Equipment					42 to 52 volts dc, positive ground
Aux Rack 1	268	20-1/2	84	20	
Ancillary/Technical Control Equipment					42 to 52 volts dc, positive ground

TABLE 1-4. (Continued)

EQUIPMENT	APPROXIMATE WEIGHT IN POUNDS	APPROXIMATE DIMENSIONS IN INCHES			POWER REQUIREMENTS
		WIDTH	HEIGHT	DEPTH	
Aux Rack 2	164	20-1/2	84	20	
Circuit and VF Patch Bay (existing rack)	200	20-1/2	96	25	
Multiplex Equipment	Refer to Technical Manual for AN/UCC-4 Multiplexer Set				
Londonderry Ancillary Equipment					42 to 52 volts dc, positive ground
Aux Rack	196	20-1/2	84	20	
Technical Control Equipment					42 to 52 volts dc, positive ground
SF Rack	208	20-1/2	84	20	
Circuit Patch Bay	200	20-1/2	96	20	
VF Patch Bay	200	20-1/2	96	20	
Multiplex Equipment	Refer to Technical Manual for AN/UCC-4 Multiplexer Set				
DC Power Plant (Thurso)					
Relay Rack With Equipment	1210	20-1/2	84	20	
Battery Rack With Batteries	2805	72	39	16	

TABLE 1-4. (Continued)

EQUIPMENT	APPROXIMATE WEIGHT IN POUNDS	APPROXIMATE DIMENSIONS IN INCHES			POWER REQUIREMENTS
		WIDTH	HEIGHT	DEPTH	
DC Power Plant (Latheron, Mormond Hill, Brown Carrick, Slieveanorra)					
Relay racks With Equipment	1210	20-1/2	84	20	
Battery Racks With Batteries	2225	72	39	16	
DC Power Plant (Kinnaber)					
Relay Rack With Equipment	1490	20-1/2	84	20	
Battery Racks With Equipment	6025	84	39	16	
DC Power Plant (Inverbervie, Edzell, Aberdeen, Craigowl Hill, East Lomond, Kirk O'Shotts, Sergeant Law)					
Relay Rack With Equipment	1210	20-1/2	84	20	
Battery Rack With Batteries	1765	60	39	16	
DC Power Plant (Dungiven)					
Relay Rack With Equipment	1210	20-1/2	84	20	
Battery Rack With Batteries	2805	72	39	16	

TABLE 1-4. (Continued)

EQUIPMENT	APPROXIMATE WEIGHT IN POUNDS	APPROXIMATE DIMENSIONS IN INCHES			POWER REQUIREMENTS
		WIDTH	HEIGHT	DEPTH	
Emergency Generator Plant (All sites except Thurso, Mormond Hill, Kinnaber, Edzell, Dungiven, Londonderry)	1750	81	45	33	
Antenna Set					
6-foot Antenna	150				
8-foot Antenna	200				
10-foot Antenna	225				
12-foot Antenna	365				
6-foot Antenna Mount (Type T4B)	50				
8/10-foot Antenna Mount (Type T10)	75				
12-foot Antenna Mount (Type T12B)	95				
6-foot Radome	30				120 volts, 50/60 Hz
8-foot Radome	70				120 volts, 50/60 Hz
10-foot Radome	100				120 volts, 50/60 Hz
12-foot Radome	140				120 volts, 50/60 Hz

TABLE 1-4. (Continued)

EQUIPMENT	APPROXIMATE WEIGHT IN POUNDS	APPROXIMATE DIMENSIONS IN INCHES			POWER REQUIREMENTS
		WIDTH	HEIGHT	DEPTH	
Dehydrator	80	24	15-3/8	14-1/2	240 volts, 50/60 Hz
S-280 Shelter, Emergency Generator	1200	87	83	146	120/240 volts, 50/60 Hz
S-280 Shelter, Radio (Modified)	1500	87	105	146	120/240 volts, 50/60 Hz
S-280 Shelter Radio and Multiplex (Modified)	3000	87	105	240	120/240 volts, 50/60 Hz

TABLE 1-5. CAPABILITIES AND LIMITATIONS

ITEM	CAPABILITY
THURSO STATION	
Frequency	
Transmit A to Latheron	8062.3 MHz
Transmit B to Latheron	7947.5 MHz
Receive A from Latheron	8221.7 MHz
Receive B from Latheron	8112.1 MHz
Polarization	
Transmit A	Horizontal
Transmit B	Horizontal
Receive A	Horizontal
Receive B	Horizontal
Path Length to Latheron	22.7 miles
Baseband Frequency Spectrum	300 Hz to 1500 kHz
Mode of Transmission	Frequency diversity
Power Output	+30 dBm
Normal Received Carrier	-34.9 dBm
Ambient Temperature Range	-22° to 122° F
Ambient Relative Humidity Range	0 to 95% (+0, -5%) at 122° F
Pressure Equivalent to Elevation Above MSL	0 to 15,000 feet
Antenna Characteristics	
Diameter	8 feet
Mounting Height	100 feet
Azimuth	150° 32' 50"
Gain (With Heated Radome)	43.3 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB

TABLE 1-5. (Continued)

ITEM	CAPABILITY
THURSO STATION (Cont)	
Beam Width	1.2°
Windload Capability (With 2-in. ice)	115 miles per hour
Antenna Tower	110-foot, self-supporting steel structure
48-Volt Battery Bank	
Number Cells	24
Specific Gravity (Fully Charged)	1.215 at 77° F
Capacity (At 8-Hour Discharge Rate)	420 ampere-hours
Waveguide Pressurization Equipment	
Outlet Pressure	3 to 8 psig
Output Dewpoint	Below -40° F
Output Capacity	1.0 cfm at 4.0 psig
Fault Reporting System	17 point alarm data transmitter
Link Reliability	99.9999%
LATHERON STATION	
Frequency	
Transmit A to Thurso	8221.7 MHz
Transmit B to Thurso	8112.1 MHz
Receive A from Thurso	8062.3 MHz
Receive B from Thurso	7947.5 MHz
Transmit A to Mormond Hill	8243.7 MHz
Transmit B to Mormond Hill	8127.5 MHz
Receive A from Mormond Hill	8032.3 MHz
Receive B from Mormond Hill	7907.1 MHz

TABLE 1-5. (Continued)

ITEM	CAPABILITY
LATHERON STATION (Cont)	
Polarization	
Transmit A to Thurso	Horizontal
Transmit B to Thurso	Horizontal
Receive A from Thurso	Horizontal
Receive B from Thurso	Horizontal
Transmit A to Mormond Hill	Vertical
Transmit B to Mormond Hill	Vertical
Receive A from Mormond Hill	Horizontal
Receive B from Mormond Hill	Horizontal
Path Length to Thurso	22.7 miles
Path Length to Mormond Hill	69.9 miles
Baseband Frequency Spectrum	300 Hz to 1500 kHz
Mode of Transmission to Thurso	Frequency diversity
Mode of Transmission to Mormond Hill	Space/frequency (quadruple) diversity
Power Output to Thurso	+30 dBm
Power Output to Mormond Hill	+37 dBm
Normal Received Carrier from Thurso	-34.9
Normal Received Carrier from Mormond Hill	-37.1 dBm
Ambient Temperature Range	-22° to 122° F
Ambient Relative Humidity Range	0 to 95% (+0, -5%) at 122° F
Pressure Equivalent to Elevation Above MSL	0 to 15,000 feet
Antenna Characteristics	
To Thurso	
Diameter	8 feet

TABLE 1-5. (Continued)

ITEM	CAPABILITY
LATHERON STATION (Cont)	
Mounting Height	45 feet
Azimuth	330° 48' 32"
Gain (With Heated Radome)	43.3 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.2°
Windload Capacity (With 2-in. ice)	115 miles per hour
To Mormond Hill	
Diameter	12 feet
Mounting Heights	190 feet and 350 feet
Azimuth	134° 41' 16"
Gain (With Heated Radome)	46.7 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	0.72°
Windload Capability (With 2-in. ice)	115 miles per hour
Antenna Tower	360-foot, guyed steel structure
48-Volt Battery Bank	
Number of Cells	24
Specific Gravity (Fully Charged)	1.215 at 77° F
Capacity (At 8-Hour Discharge Rate)	320 ampere-hours
Battery Chargers/Rectifiers	
Output Voltage (DC)	52.0 to 54.0 volts normal operation
Output Current (Full Load)	100 amperes
Regulation	±1% from 0% load to 100% load and with ±10% line voltage variation and ±5% line frequency change

TABLE 1-5. (Continued)

ITEM	CAPABILITY
LATHERON STATION (Cont)	
Voltage Ripple	30 mV rms maximum
Waveguide Pressurization Equipment	
Outlet Pressure	3 to 8 psig
Output Dewpoint	Below -40° F
Output Capacity	1.0 cfm at 4.0 psig
Fault Reporting System	17 point alarm data transmitter
Link Reliability	99.9999%
Shelter Specifications	
Generator Shelter	
Size (Inside Dimensions)	138"L x 81-1/2"W x 74-1/2"H
Weight	1250 pounds maximum
Power Capacity	20 kW, 120/240 Vac, 1-ϕ, 3-wire
Radio Shelter	
Size (Inside Dimensions)	138"L x 81-1/2"W x 96"H
Weight	1450 pounds maximum
Heater Capacity	10,236 Btu/hr
MORMOND HILL STATION	
Frequency	
Transmit A to Latheron	8032.3 MHz
Transmit B to Latheron	7907.1 MHz
Receive A from Latheron	8243.7 MHz
Receive B from Latheron	8127.5 MHz
Transmit A to Aberdeen	8062.5 MHz
Transmit B to Aberdeen	7947.7 MHz

TABLE 1-5. (Continued)

ITEM	CAPABILITY
MORMOND HILL STATION (Cont)	
Receive A from Aberdeen	8227.1 MHz
Receive B from Aberdeen	8112.3 MHz
Polarization	
Transmit A to Latheron	Horizontal
Transmit B to Latheron	Horizontal
Receive A from Latheron	Vertical
Receive B from Latheron	Vertical
Transmit A to Aberdeen	Vertical
Transmit B to Aberdeen	Vertical
Receive A from Aberdeen	Vertical
Receive B from Aberdeen	Vertical
Path Length to Latheron	69.9 miles
Path Length to Aberdeen	36.7 miles
Baseband Frequency Spectrum	300 Hz to 1500 kHz
Mode of Transmission to Latheron	Frequency/space diversity
Mode of Transmission to Aberdeen	Frequency diversity
Power Output to Latheron	+37 dBm
Power Output to Aberdeen	+30 dBm
Normal Received Carrier from Latheron	-37.1 dBm
Normal Received Carrier from Aberdeen	-29.7 dBm
Ambient Temperature Range	-22° to 122° F
Ambient Relative Humidity Range	0 to 95% (+0, -5%) at 122° F
Pressure Equivalent to Elevation Above MSL	0 to 15,000 feet

TABLE 1-5. (Continued)

ITEM	CAPABILITY
MORMOND HILL STATION (Cont)	
Antenna Characteristics	
To Latheron	
Diameter	12 feet
Mounting Heights	190 feet and 350 feet
Azimuth	315° 49' 31"
Gain (With Heated Radome)	46.7 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	0.72°
Windload Capacity (With 2-in. ice)	115 miles per hour
To Aberdeen	
Diameter	10 feet
Mounting Height	190 feet
Azimuth	188° 15' 32"
Gain (With Heated Radome)	45.0 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	0.89°
Windload Capacity (With 2-in. ice)	115 miles per hour
Antenna Tower	360-foot guyed steel structure
48-Volt Battery Bank	
Number Cells	24
Specific Gravity	1.215 at 77° F
Capacity (At 8-Hour Discharge Rate)	320 ampere-hours
Battery Charger/Rectifiers	
Output Voltage (DC)	52.0 to 54.0 volts, normal operation

TABLE 1-5. (Continued)

ITEM	CAPABILITY
MORMOND HILL STATION (Cont)	
Output Current (Full Load)	100 amperes
Regulation	±1% from 0 to 100% load and with ±10% line voltage variation and ±5% line frequency change
Voltage Ripple	30 mV rms maximum
Waveguide Pressurization Equipment	
Outlet Pressure	3 to 8 psig
Dewpoint	Below -40° F
Output Capacity	1.0 cfm at 4.0 psig
Fault Reporting System	17 point alarm data transmitter
Link Reliability	99.9999%
ABERDEEN STATION	
Frequency	
Transmit A to Mormond Hill	8227.1 MHz
Transmit B to Mormond Hill	8112.3 MHz
Receive A from Mormond Hill	8062.5 MHz
Receive B from Mormond Hill	7947.7 MHz
Transmit A to Inverbervie	8243.1 MHz
Transmit B to Inverbervie	8127.9 MHz
Receive A from Inverbervie	8032.5 MHz
Receive B from Inverbervie	7907.3 MHz
Polarization	
Transmit A to Mormond Hill	Vertical
Transmit B to Mormond Hill	Vertical

TABLE 1-5. (Continued)

ITEM	CAPABILITY
ABERDEEN STATION (Cont)	
Receive A from Mormond Hill	Vertical
Receive B from Mormond Hill	Vertical
Transmit A to Inverbervie	Vertical
Transmit B to Inverbervie	Vertical
Receive A from Inverbervie	Vertical
Receive B from Inverbervie	Vertical
Path Length to Mormond Hill	36.7 miles
Path Length to Inverbervie	15.8 miles
Baseband Frequency Spectrum	300 Hz to 1500 kHz
Mode of Transmission	Frequency diversity
Power Output	+37 dBm
Normal Received Carrier from Mormond Hill	-36.7 dBm
Normal Received Carrier from Inverbervie	-27.8 dBm
Ambient Temperature Range	-22° to 122° F
Ambient Relative Humidity Range	0 to 95% (+0, -5%) at 122° F
Pressure Equivalent to Elevation Above MSL	0 to 15,000 feet
Antenna Characteristics	
To Mormond Hill	
Diameter	12 feet
Mounting Height	25 feet
Azimuth	08° 08' 25"
Gain (With Heated Radome)	46.7 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB

TABLE 1-5. (Continued)

ITEM	CAPABILITY
ABERDEEN STATION (Cont)	
Beam Width	0.72°
Windload Capacity	115 miles per hour
To Inverbervie	
Diameter	6 feet
Mounting Height	15 feet
Azimuth	191° 47' 22"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
Antenna Tower	30-foot self-supporting tower
48-Volt Battery Bank	
Number Cells	24
Specific Gravity (Fully Charged)	1.215 at 77° F
Capacity (At 8-Hour Discharge Rate)	240 ampere-hours
Battery Charger/Rectifiers	
Output Voltage (DC)	52.0 to 54.0 volts, normal operation
Output Current (Full Load)	100 amperes
Regulation	±1% from 0 to 100% load and with ±10% line voltage variation and ±5% line frequency change
Voltage Ripple	30 mV rms maximum
Waveguide Pressurization Equipment	
Outlet Pressure	3 to 8 psig
Dewpoint	Below -40° F
Output Capacity	1.0 cfm at 4.0 psig

TABLE 1-5. (Continued)

ITEM	CAPABILITY
ABERDEEN STATION (Cont)	
Fault Reporting System	17 point alarm data transmitter
Shelter Specifications	
Generator Shelter	
Size (Inside Dimensions)	138"L x 81-1/2"W x 74-1/2"H
Weight	1250 pounds maximum
Power Capacity	20 kW
Radio Shelter	
Size (Inside Dimensions)	138"L x 81-1/2"W x 96"H
Weight	1450 pounds maximum
Heater Capacity	10,236 Btu/hr
Link Reliability	99.9999%
INVERBERVIE STATION	
Frequency	
Transmit A to Aberdeen	8032.5 MHz
Transmit B to Aberdeen	7907.3 MHz
Receive A from Aberdeen	8243.1 MHz
Receive B from Aberdeen	8127.9 MHz
Transmit A to Kinnaber	8062.7 MHz
Transmit B to Kinnaber	7947.1 MHz
Receive A from Kinnaber	8227.3 MHz
Receive B from Kinnaber	8112.5 MHz
Polarization	
Transmit A to Aberdeen	Vertical
Transmit B to Aberdeen	Vertical

TABLE 1-5. (Continued)

ITEM	CAPABILITY
INVERBERVIE STATION (Cont)	
Receive A from Aberdeen	Vertical
Receive B from Aberdeen	Vertical
Transmit A to Kinnaber	Horizontal
Transmit B to Kinnaber	Horizontal
Receive A from Kinnaber	Horizontal
Receive B from Kinnaber	Horizontal
Path Length to Aberdeen	15.8 miles
Path Length to Kinnaber	9.9 miles
Baseband Frequency Spectrum	300 Hz to 1500 kHz
Mode of Transmission	Frequency diversity
Power Output	+37 dBm
Normal Received Carrier from Aberdeen	-27.8 dBm
Normal Received Carrier from Kinnaber	-35.5 dBm
Ambient Temperature Range	-22° to 122° F
Ambient Relative Humidity Range	0 to 95% (+0, -5%) at 122° F
Pressure Equivalent to Elevation Above MSL	0 to 15,000 feet
Antenna Characteristics	
To Aberdeen	
Diameter	6 feet
Mounting Height	45 feet
Azimuth	11° 43' 04"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB

TABLE 1-5. (Continued)

ITEM	CAPABILITY
INVERBERVIE STATION (Cont)	
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
To Kinnaber	
Diameter	6 feet
Mounting Height	95 feet
Azimuth	222° 39' 12"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
Antenna Tower	100-foot guyed steel structure
48-Volt Battery Bank	
Number Cells	24
Specific Gravity (Fully Charged)	1.215 at 77° F
Capacity (At 8-Hour Discharge Rate)	240 ampere-hours
Battery Charger/Rectifiers	
Output Voltage (DC)	52.0 to 54.0 volts, normal operation
Output Current (Full Load)	100 amperes
Regulation	±1% from 0 to 100% load and with ±10% line voltage variation and ±5% line frequency change
Voltage Ripple	30 mV rms maximum
Waveguide Pressurization Equipment	
Outlet Pressure	3 to 8 psig
Dewpoint	Below -40° F
Output Capacity	1.0 cfm at 4.0 psig

TABLE 1-5. (Continued)

ITEM	CAPABILITY
INVERBERVIE STATION (Cont)	
Fault Reporting System	17 point alarm data transmitter
Shelter Specifications	
Generator Shelter	
Size (Inside Dimensions)	138"L x 81-1/2"W x 74-1/2"H
Weight	1250 pounds
Power Capacity	20 kW
Radio Shelter	
Size (Inside Dimensions)	138"L x 81-1/2"W x 96"H
Weight	1450 pounds maximum
Heater Capacity	10,236 Btu/hr
Link Reliability	99.9999%
KINNABER STATION	
Frequency	
Transmit A to Inverbervie	8227.3 MHz
Transmit B to Inverbervie	8112.5 MHz
Receive A from Inverbervie	8062.7 MHz
Receive B from Inverbervie	7947.1 MHz
Transmit A to Edzell	8234.7 MHz
Transmit B to Edzell	8170.0 MHz
Receive A from Edzell	8047.5 MHz
Receive B from Edzell	7922.1 MHz
Transmit A to Craigowl Hill	8243.5 MHz
Transmit B to Craigowl Hill	8127.1 MHz
Receive A from Craigowl Hill	8032.7 MHz
Receive B from Craigowl Hill	7907.3 MHz

TABLE 1-5. (Continued)

ITEM	CAPABILITY
KINNABER STATION (Cont)	
Polarization	
Transmit A to Inverbervie	Horizontal
Transmit B to Inverbervie	Horizontal
Receive A from Inverbervie	Horizontal
Receive B from Inverbervie	Horizontal
Transmit A to Edzell	Vertical
Transmit B to Edzell	Vertical
Receive A from Edzell	Vertical
Receive B from Edzell	Vertical
Transmit A to Craigowl Hill	Horizontal
Transmit B to Craigowl Hill	Horizontal
Receive A from Craigowl Hill	Horizontal
Receive B from Craigowl Hill	Horizontal
Path Length to Inverbervie	9.9 miles
Path Length to Edzell	7.7 miles
Path Length to Craigowl Hill	25.8 miles
Baseband Frequency Spectrum	300 Hz to 1500 kHz
Mode of Transmission	Frequency diversity
Power Output to Inverbervie/Edzell	+30 dBm
Power Output to Craigowl Hill	+37 dBm
Normal Received Carrier from Inverbervie	-28.5 dBm
Normal Received Carrier from Edzell	-33.1 dBm
Normal Received Carrier from Craigowl Hill	-34.4 dBm
Ambient Temperature Range	-22° to 122° F

TABLE 1-5. (Continued)

ITEM	CAPABILITY
KINNABER STATION (Cont)	
Ambient Relative Humidity Range	0 to 95% (+0, -5%) at 122° F
Pressure Equivalent to Elevation Above MSL	0 to 15,000 feet
Antenna Characteristics	
To Inverbervie	
Diameter	6 feet
Mounting Height	185 feet
Azimuth	42° 30' 20"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
To Edzell	
Diameter	6 feet
Mounting Height	180 feet
Azimuth	304° 43' 30"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
To Craigowl Hill	
Diameter	6 feet
Mounting Height	125 feet
Azimuth	238° 40' 27"
Gain (With Heated Radome)	40.8 dB

TABLE 1-5. (Continued)

ITEM	CAPABILITY
KINNABER STATION (Cont)	
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
Antenna Tower	190-foot guyed steel structure
48-Volt Battery Bank	
Number Cells	24
Specific Gravity (Fully Charged)	1.215 at 77° F
Capacity (At 8-Hour Discharge Rate)	980 ampere-hours
Battery Charger/Rectifiers	
Output Voltage (DC)	52.0 to 54.0 volts, normal operation
Output Current (Full Load)	200 amperes
Regulation	±1% from 0 to 100% and with ±10% line voltage variation and ±5% line frequency change
Voltage Ripple	30 mV rms maximum
Waveguide Pressurization Equipment	
Outlet Pressure	3 to 8 psig
Dewpoint	Below -40° F
Output Capacity	1.0 cfm at 4.0 psig
Fault Reporting System	17 point alarm data transmitter
Link Reliability	99.9999%
EDZELL STATION	
Frequency	
Transmit A to Kinnaber	8047.5 MHz
Transmit B to Kinnaber	7922.1 MHz

TABLE 1-5. (Continued)

ITEM	CAPABILITY
EDZELL STATION (Cont)	
Receive A from Kinnaber	8234.7 MHz
Receive B from Kinnaber	8170.0 MHz
Polarization	
Transmit A to Kinnaber	Vertical
Transmit B to Kinnaber	Vertical
Receive A from Kinnaber	Vertical
Receive B from Kinnaber	Vertical
Path Length to Kinnaber	7.7 miles
Baseband Frequency Spectrum	300 Hz to 1500 kHz
Mode of Transmission	Frequency diversity
Power Output	+30 dBm
Normal Received Carrier	-33.1 dBm
Ambient Temperature Range	-22° to 122° F
Ambient Relative Humidity Range	0 to 95% (+0, -5%) at 122° F
Pressure Equivalent to Elevation Above MSL	0 to 15,000 feet
Antenna Characteristics	
Diameter	6 feet
Mounting Height	75 feet
Azimuth	124° 35' 06"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour

TABLE 1-5. (Continued)

ITEM	CAPABILITY
EDZELL STATION (Cont)	
Antenna Tower	80-foot self-supporting structure
48-Volt Battery Bank	
Number Cells	24
Specific Gravity (Fully Charged)	1.215 at 77° F
Capacity (At 8-Hour Discharge Rate)	240 ampere-hours
Battery Charger/Rectifiers	
Output Voltage (DC)	52.0 to 54.0 volts, normal operation
Output Current (Full Load)	100 amperes
Regulation	±1% from 0 to 100% load and with ±10% line voltage variation and ±5% line frequency change
Voltage Ripple	30 mV rms maximum
Waveguide Pressurization Equipment	
Outlet Pressure	3 to 8 psig
Dewpoint	Below -40° F
Output Capacity	1.0 cfm at 4.0 psig
Fault Reporting System	17 point alarm data transmitter
Radio/Mux Specification	
Size (Inside Dimensions)	232"W x 81-1/2"L x 96"H
Weight	2800 pounds maximum
Heater Capacity	10,236 Btu/hr
Link Reliability	99.9999%
CRAIGOWL HILL STATION	
Frequency	
Transmit A to Kinnaber	8032.7 MHz
Transmit B to Kinnaber	7907.3 MHz

TABLE 1-5. (Continued)

ITEM	CAPABILITY
CRAIGOWL HILL STATION (Cont)	
Receive A from Kinnaber	8243.5 MHz
Receive B from Kinnaber	8127.1 MHz
Transmit A to East Lomond	8062.9 MHz
Transmit B to East Lomond	7947.7 MHz
Receive A from East Lomond	8227.3 MHz
Receive B from East Lomond	8112.5 MHz
Polarization	
Transmit A to Kinnaber	Horizontal
Transmit B to Kinnaber	Horizontal
Receive A from Kinnaber	Horizontal
Receive B from Kinnaber	Horizontal
Transmit A to East Lomond	Vertical
Transmit B to East Lomond	Vertical
Receive A from East Lomond	Vertical
Receive B from East Lomond	Vertical
Path Length to Kinnaber	25.8 miles
Path Length to East Lomond	22.5 miles
Baseband Frequency Spectrum	300 Hz to 1500 kHz
Mode of Transmission	Frequency diversity
Power Output	+37 dBm
Normal Received Carrier from Kinnaber	-34.4 dBm
Normal Received Carrier from East Lomond	-30.9 dBm
Ambient Temperature Range	-22° to 122° F
Ambient Relative Humidity Range	0 to 95% (+0, -5%) at 122° F
Pressure Equivalent to Elevation Above MSL	0 to 15,000 feet

TABLE 1-5. (Continued)

ITEM	CAPABILITY
CRAIGOWL HILL STATION (Cont)	
Antenna Characteristics	
To Kinnaber	
Diameter	6 feet
Mounting Height	18 feet
Azimuth	57° 42' 22"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
To East Lomond	
Diameter	6 feet
Mounting Height	18 feet
Azimuth	199° 14' 08"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
Antenna Tower	20-foot self-supporting wooden structure
48-Volt Battery Bank	
Number Cells	24
Specific Gravity (Fully Charged)	1.215 at 77° F
Capacity (At 8-Hour Discharge Rate)	240 ampere-hours
Battery Charger/Rectifiers	
Output Voltage (DC)	52.0 to 54.0 volts, normal operation

TABLE 1-5. (Continued)

ITEM	CAPABILITY
CRAIGOWL HILL STATION (Cont)	
Output Current (Full Load)	100 amperes
Regulation	±1% from 0 to 100% load and with ±10% line voltage variation and ±5% line frequency change
Voltage Ripple	30 mV rms maximum
Waveguide Pressurization Equipment	
Outlet Pressure	3 to 8 psig
Dewpoint	Below -40° F
Output Capacity	1.0 cfm at 4.0 psig
Fault Reporting Equipment	17 point alarm data transmitter
Shelter Specifications	
Generator Shelter	
Size (Inside Dimensions)	138"L x 81-1/2"W x 74-1/2"H
Weight	1250 pounds maximum
Power Capacity	20 kW
Radio Shelter	
Size	138"L x 81-1/2"W x 96"H
Weight	1450 pounds maximum
Heater Capacity	10,236 Btu/hr
Link Reliability	99.9999%
EAST LOMOND STATION	
Frequency	
Transmit A to Craigowl Hill	8227.3 MHz
Transmit B to Craigowl Hill	8112.5 MHz

TABLE 1-5. (Continued)

ITEM	CAPABILITY
EAST LOMOND STATION (Cont)	
Receive A from Craigowl Hill	8062.9 MHz
Receive B from Craigowl Hill	7947.7 MHz
Transmit A to Kirk O'Shotts	8243.7 MHz
Transmit B to Kirk O'Shotts	8127.3 MHz
Receive A from Kirk O'Shotts	8032.9 MHz
Receive B from Kirk O'Shotts	7907.5 MHz
Polarization	
Transmit A to Craigowl Hill	Vertical
Transmit B to Craigowl Hill	Vertical
Receive A from Craigowl Hill	Vertical
Receive B from Craigowl Hill	Vertical
Transmit A to Kirk O'Shotts	Vertical
Transmit B to Kirk O'Shotts	Vertical
Receive A from Kirk O'Shotts	Vertical
Receive B from Kirk O'Shotts	Vertical
Path Length to Craigowl Hill	22.5 miles
Path Length to Kirk O'Shotts	36.0 miles
Baseband Frequency Spectrum	300 Hz to 1500 kHz
Mode of Transmission	Frequency diversity
Power Output	+37 dBm
Normal Received Carrier from Craigowl Hill	-30.9 dBm
Normal Received Carrier from Kirk O'Shotts	-37.2 dBm
Ambient Temperature Range	-22° to 122° F
Ambient Relative Humidity Range	0 to 95% (+0, -5%) at 122° F
Pressure Equivalent to Elevation Above MSL	0 to 15,000 feet

TABLE 1-5. (Continued)

ITEM	CAPABILITY
EAST LOMOND STATION (Cont)	
Antenna Characteristics	
To Craigowl Hill	
Diameter	6 feet
Mounting Height	30 feet
Azimuth	190° 04' 28"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
To Kirk O'Shotts	
Diameter	6 feet
Mounting Height	50 feet
Azimuth	221° 52' 10"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
Antenna Tower	60-foot self-supporting steel structure
48-Volt Battery Bank	
Number Cells	24
Specific Gravity (Fully Charged)	1.215 at 77° F
Capacity (At 8-Hour Discharge Rate)	240 ampere-hours
Battery Charger/Rectifiers	
Output Voltage (DC)	52.0 to 54.0 volts, normal operation

TABLE 1-5. (Continued)

ITEM	CAPABILITY
EAST LOMOND STATION (Cont)	
Output Current (Full Load)	100 amperes
Regulation	±1% from 0 to 100% load and with ±10% line voltage variation and ±5% line frequency change
Voltage Ripple	30 mV rms maximum
Waveguide Pressurization Equipment	
Outlet Pressure	3 to 8 psig
Dewpoint	Below -40° F
Output Capacity	1.0 cfm at 4.0 psig
Fault Reporting System	17 point alarm data transmitter
Shelter Specifications	
Generator Shelter	
Size (Inside Dimensions)	138"L x 81-1/2"W x 74-1/2"H
Weight	1250 pounds maximum
Power Capacity	20 kW
Radio Shelter	
Size (Inside Dimensions)	138"L x 81-1/2"W x 96"H
Weight	1450 pounds maximum
Heater Capacity	10,236 Btu/hr
Link Reliability	99.9999%
KIRK O'SHOTTS STATION	
Frequency	
Transmit A to East Lomond	8032.9 MHz
Transmit B to East Lomond	7907.5 MHz

TABLE 1-5. (Continued)

ITEM	CAPABILITY
KIRK O'SHOTTS STATION (Cont)	
Receive A from East Lomond	8243.7 MHz
Receive B from East Lomond	8127.3 MHz
Transmit A to Sergeant Law	8062.1 MHz
Transmit B to Sergeant Law	7947.9 MHz
Receive A from Sergeant Law	8227.5 MHz
Receive B from Sergeant Law	8112.7 MHz
Polarization	
Transmit A to East Lomond	Vertical
Transmit B to East Lomond	Vertical
Receive A from East Lomond	Vertical
Receive B from East Lomond	Vertical
Transmit A to Sergeant Law	Horizontal
Transmit B to Sergeant Law	Horizontal
Receive A from Sergeant Law	Horizontal
Receive B from Sergeant Law	Horizontal
Path Length to East Lomond	36.0 miles
Path Length to Sergeant Law	24.9 miles
Baseband Frequency Spectrum	300 Hz to 1500 kHz
Mode of Transmission	Frequency diversity
Power Output	+37 dBm
Normal Received Carrier from East Lomond	-37.2 dBm
Normal Received Carrier from Sergeant Law	-34.0 dBm
Ambient Temperature Range	-22° to 122°F
Ambient Relative Humidity Range	0 to 95% (+0, -5%) at 122°F
Pressure Equivalent to Elevation Above MSL	0 to 15,000 feet

TABLE 1-5. (Continued)

ITEM	CAPABILITY
KIRK O'SHOTTS STATION (Cont)	
Antenna Characteristics	
To East Lomond	
Diameter	6 feet
Mounting Height	90 feet
Azimuth	41° 21' 22"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
To Sergeant Law	
Diameter	6 feet
Mounting Height	90 feet
Azimuth	263° 11' 06"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capacity (With 2-in. ice)	115 miles per hour
Antenna Tower	100-foot self-supporting steel structure
48-Volt Battery Bank	
Number Cells	24
Specific Gravity (Full Charged)	1.215 at 77° F
Capacity (At 8-Hour Discharge Rate)	240 ampere-hours

TABLE 1-5. (Continued)

ITEM	CAPABILITY
KIRK O'SHOTTS STATION (Cont)	
Battery Charger/Rectifiers	
Output Voltage (DC)	52.0 to 54.0 volts, normal operation
Output Current (Full load)	100 amperes
Regulation	±1% from 0 to 100% load and with ±10% line voltage variation and ±5% line frequency change
Voltage Ripple	30 mV rms maximum
Waveguide Pressurization Equipment	
Outlet Pressure	3 to 8 psig
Dewpoint	Below -40° F
Output Capacity	1.0 cfm at 4.0 psig
Fault Reporting System	17 point alarm data transmitter
Shelter Specifications	
Generator Shelter	
Size (Inside Dimensions)	138"L x 81-1/2"W x 74"H
Weight	1250 pounds maximum
Power Capacity	20 kW
Radio Shelter	
Size	138"L x 81-1/2"W x 96"H
Weight	1450 pounds maximum
Heater Capacity	10,236 Btu/hr
Link Reliability	99.9999%

TABLE 1-5. (Continued)

ITEM	CAPABILITY
SERGEANT LAW STATION	
Frequency	
Transmit A to Kirk O'Shotts	8227.5 MHz
Transmit B to Kirk O'Shotts	8112.7 MHz
Receive A from Kirk O'Shotts	8062.1 MHz
Receive B from Kirk O'Shotts	7947.9 MHz
Transmit A to Brown Carrick	8243.9 MHz
Transmit B to Brown Carrick	8127.5 MHz
Receive A from Brown Carrick	8032.1 MHz
Receive B from Brown Carrick	7907.7 MHz
Polarization	
Transmit A to Kirk O'Shotts	Horizontal
Transmit B to Kirk O'Shotts	Horizontal
Receive A from Kirk O'Shotts	Horizontal
Receive B from Kirk O'Shotts	Horizontal
Transmit A to Brown Carrick	Horizontal
Transmit B to Brown Carrick	Horizontal
Receive A from Brown Carrick	Horizontal
Receive B from Brown Carrick	Horizontal
Path Length to Kirk O'Shotts	24.9 miles
Path Length to Brown Carrick	28.9 miles
Baseband Frequency Spectrum	300 Hz to 1500 kHz
Mode of Transmission	Frequency diversity
Power Output	+37 dBm
Normal Received Carrier from Kirk O'Shotts	-34.0 dBm
Normal Received Carrier from Brown Carrick	-37.7 dBm

TABLE 1-5. (Continued)

ITEM	CAPABILITY
SERGEANT LAW STATION (Cont)	
Ambient Temperature Range	-22° to 122° F
Ambient Relative Humidity Range	0 to 95% (+0, -5%) at 122° F
Pressure Equivalent to Elevation Above MSL	0 to 15,000 feet
Antenna Characteristics	
To Kirk O'Shotts	
Diameter	6 feet
Mounting Height	30 feet
Azimuth	82° 39' 28"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
To Brown Carrick	
Diameter	6 feet
Mounting Height	145 feet
Azimuth	198° 43' 49"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
Antenna Tower	150-foot self-supporting steel structure

TABLE 1-5. (Continued)

ITEM	CAPABILITY
SERGEANT LAW STATION (Cont)	
48-Volt Battery Bank	
Number Cells	24
Specific Gravity (Fully Charged)	1.215 at 77° F
Capacity (At 8-Hour Discharge Rate)	320 ampere-hours
Battery Charger/Rectifiers	
Output Voltage (DC)	52.0 to 54.0 volts, normal operation
Output Current (Full Load)	100 amperes
Regulation	±1% from 0 to 100% load and with ±10% line voltage variation and ±5% line frequency change
Voltage Ripple	30 mV rms maximum
Waveguide Pressurization Equipment	
Outlet Pressure	3 to 8 psig
Dewpoint	Below -40° F
Output Capacity	1.0 cfm at 4.0 psig
Fault Reporting System	17 point alarm data transmitter
Shelter Specifications	
Generator Shelter	
Size (Inside Dimensions)	138"L x 81-1/2"W x 74-1/2"H
Weight	1250 pounds maximum
Power Capacity	20 kW
Radio Shelter	
Size (Inside Dimensions)	138"L x 81-1/2"W x 96"H
Weight	1450 pounds maximum
Heater Capacity	10,236 Btu/hr
Link Reliability	99.9999%

TABLE 1-5. (Continued)

ITEM	CAPABILITY
BROWN CARRICK STATION	
Frequency	
Transmit A to Sergeant Law	8032.1 MHz
Transmit B to Sergeant Law	7907.7 MHz
Receive A from Sergeant Law	8243.9 MHz
Receive B from Sergeant Law	8127.5 MHz
Transmit A to Slieveanorra	8062.3 MHz
Transmit B to Slieveanorra	7947.1 MHz
Receive A from Slieveanorra	8227.7 MHz
Receive B from Slieveanorra	8112.9 MHz
Polarization	
Transmit A to Sergeant Law	Horizontal
Transmit B to Sergeant Law	Horizontal
Receive A from Sergeant Law	Horizontal
Receive B from Sergeant Law	Horizontal
Transmit A to Slieveanorra	Vertical
Transmit B to Slieveanorra	Vertical
Receive A from Slieveanorra	Horizontal
Receive B from Slieveanorra	Horizontal
Path Length to Sergeant Law	28.9 miles
Path Length to Slieveanorra	64.2 miles
Baseband Frequency Spectrum	300 Hz to 1500 kHz
Mode of Transmission to Sergeant Law	Frequency diversity
Mode of Transmission to Slieveanorra	Frequency/space (quadruple) diversity
Power Output	+37 dB
Normal Received Carrier from Sergeant Law	-37.7 dBm

TABLE 1-5. (Continued)

ITEM	CAPABILITY
BROWN CARRICK STATION (Cont)	
Normal Received Carrier from Slieveanorra	-31.9 dBm
Ambient Temperature Range	-22° to 122° F
Ambient Relative Humidity Range	0 to 95% (+0, -5%) at 122° F
Pressure Equivalent to Elevation Above MSL	0 to 15,000 feet
Antenna Characteristics	
To Sergeant Law	
Diameter	6 feet
Mounting Height	120 feet
Azimuth	18° 32' 05"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
To Slieveanorra	
Diameter	12 feet
Mounting Heights	120 and 124 feet
Azimuth	249° 26' 32"
Gain (With Heated Radome)	46.7 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	0.72°
Windload Capability (With 2-in. ice)	115 miles per hour
Antenna Tower	130-foot self-supporting steel structure

TABLE 1-5. (Continued)

ITEM	CAPABILITY
BROWN CARRICK STATION (Cont)	
48-Volt Battery Bank	
Number Cells	24
Specific Gravity (Fully Charged)	1.215 at 77° F
Capacity (At 8-Hour Discharge Rate)	320 ampere-hours
Battery Charger/Rectifiers	
Output Voltage (DC)	52.0 to 54.0 volts normal operation
Output Current (Full Load)	100 amperes
Regulation	±1% from 0 to 100% load and with ±10% line voltage variation and ±5% line frequency change
Voltage Ripple	30 mV rms maximum
Waveguide Pressurization Equipment	
Outlet Pressure	3 to 8 psig
Dewpoint	Below -40° F
Output Capacity	1.0 cfm at 4.0 psig
Fault Reporting System	17 point alarm data transmitter
Generator Shelter	
Size (Inside Dimensions)	138"L x 81-1/2"W x 74-1/2"H
Weight	1250 pounds maximum
Power Capacity	20 kW
Radio Shelter	
Size	138"L x 81-1/2"W x 96"H
Weight	1450 pounds maximum
Heater Capacity	10,236 Btu/hr
Link Reliability	99.9999%

TABLE 1-5. (Continued)

ITEM	CAPABILITY
SLIEVEANORRA STATION	
Frequency	
Transmit A to Brown Carrick	8227.7 MHz
Transmit B to Brown Carrick	8112.9 MHz
Receive A from Brown Carrick	8062.3 MHz
Receive B from Brown Carrick	7947.1 MHz
Transmit A to Dungiven	8243.1 MHz
Transmit B to Dungiven	8127.7 MHz
Receive A from Dungiven	8032.3 MHz
Receive B from Dungiven	7907.9 MHz
Polarization	
Transmit A to Brown Carrick	Horizontal
Transmit B to Brown Carrick	Horizontal
Receive A from Brown Carrick	Vertical
Receive B from Brown Carrick	Vertical
Transmit A to Dungiven	Vertical
Transmit B to Dungiven	Vertical
Receive A from Dungiven	Vertical
Receive B from Dungiven	Vertical
Path Length to Brown Carrick	64.2 miles
Path Length to Dungiven	26.6 miles
Baseband Frequency Spectrum	300 Hz to 1500 kHz
Mode of Transmission to Brown Carrick	Frequency/space (quadruple) diversity
Mode of Transmission to Dungiven	Frequency diversity
Power Output	+37 dBm
Normal Received Carrier from Brown Carrick	-31.9 dBm

TABLE 1-5. (Continued)

ITEM	CAPABILITY
SLIEVEANORRA STATION (Cont)	
Normal Received Carrier from Dungiven	-33.2 dBm
Ambient Temperature Range	-22° to 122° F
Ambient Relative Humidity Range	0 to 95% (+0, -5%) at 122° F
Pressure Equivalent to Elevation Above MSL	0 to 15,000 feet
Antenna Characteristics	
To Brown Carrick	
Diameter	12 feet
Mounting Heights	64 and 48.8 feet
Azimuth	68° 11' 36"
Gain (With Heated Radome)	46.7 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	0.72°
Windload Capability (With 2-in. ice)	115 miles per hour
To Dungiven	
Diameter	6 feet
Mounting Height	20 feet
Azimuth	249° 12' 18"
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
Antenna Tower	70-foot self-supporting steel structure

TABLE 1-5. (Continued)

ITEM	CAPABILITY
SLIEVEANORRA STATION (Cont)	
48-Volt Battery Bank	
Number Cells	24
Specific Gravity (Fully Charged)	1.215 at 77° F
Capacity (At 8-Hour Discharge Rate)	320 ampere-hours
Battery Charger/Rectifiers	
Output Voltage (DC)	52.0 to 54.0 volts, normal operation
Output Current (Full Load)	100 amperes
Regulation	±1% from 0 to 100% load and with ±10% line voltage variation and ±5% line frequency change
Voltage Ripple	30 mV rms maximum
Waveguide Pressurization Equipment	
Outlet Pressure	3 to 8 psig
Dewpoint	-40° F
Output Capacity	1.0 cfm at 4.0 psig
Fault Reporting System	17 point alarm data transmitter
Shelter Specifications	
Generator Shelter	
Size (Inside Dimensions)	138"L x 81-1/2"W x 74-1/2"H
Weight	1250 pounds maximum
Power Capacity	20 kW
Radio Shelter	
Size (Inside Dimensions)	138"L x 81-1/2"W x 96"H
Weight	1450 pounds maximum
Heater Capacity	10.326 Btu/hr
Link Reliability	99.9999%

TABLE 1-5. (Continued)

ITEM	CAPABILITY
DUNGIVEN STATION	
Note The Dungiven-Londonderry link is via an existing microwave system.	
Frequency	
Transmit A to Slieveanorra	8032.3 MHz
Transmit B to Slieveanorra	7907.9 MHz
Receive A from Slieveanorra	8243.1 MHz
Receive B from Slieveanorra	8127.7 MHz
Polarization	
Transmit A to Slieveanorra	Vertical
Transmit B to Slieveanorra	Vertical
Receive A from Slieveanorra	Vertical
Receive B from Slieveanorra	Vertical
Path Length to Slieveanorra	26.6 miles
Baseband Frequency Spectrum	300 Hz to 1500 kHz
Mode of Transmission to Slieveanorra	Frequency diversity
Power Output	+37 dBm
Normal Received Carrier	-33.2 dBm
Ambient Temperature Range	-22° to 122° F
Ambient Relative Humidity Range	0 to 95% (+0, -5%) at 122° F
Pressure Equivalent to Elevation Above MSL	0 to 15,000 feet
Antenna Characteristics	
Diameter	6 feet
Mounting Height	30 feet
Azimuth	68° 41' 30"

TABLE 1-5. (Continued)

ITEM	CAPABILITY
DUNGIVEN STATION (Cont)	
Gain (With Heated Radome)	40.8 dB
Voltage Standing Wave Ratio	1.08:1
Maximum Side Lobe	-20 dB
Beam Width	1.45°
Windload Capability (With 2-in. ice)	115 miles per hour
Antenna Tower	Existing 200-foot self-supporting tower
48-Volt Battery Bank	
Number Cells	24
Specific Gravity (Fully Charged)	1.215 at 77° F
Capacity (At 8-Hour Discharge Rate)	420 ampere-hours
Battery Charger/Rectifiers	
Output Voltage (DC)	52.0 to 54.0 volts, normal operation
Output Current (Full Load)	100 amperes
Regulation	±1% from 0 to 100% load and with ±10% line voltage variation and ±5% line frequency change
Voltage Ripple	30 mV rms maximum
Waveguide Pressurization Equipment	
Outlet Pressure	3 to 8 psig
Dewpoint	Below -40° F
Output Capacity	1.0 cfm at 4.0 psig
Fault Reporting System	17 point alarm data transmitter
Link Reliability	99.9999%

TABLE 1-5. (Continued)

ITEM	CAPABILITY
LONDONDERRY STATION	
Note The Londonderry to Dungiven link is via an existing microwave system.	
Fault Reporting System	17 point alarm data receiver set
Ambient Temperature Range	-22° to 122° F
Ambient Relative Humidity Range	0 to 95% (+0, -5%) at 122° F
Pressure Equivalent to Elevation Above MSL	0 to 15,000 feet

TABLE 1-6. EQUIPMENT SUPPLIED

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	THURSO STATION		
Radio Set, AN/GRC-169(V)10	Microwave Terminal Station		607-1821-001
	MW-508D Remodulating Microwave Radio Set (Type I)	1	616-0796-001
	RF Rack	1	607-1855-001
Transmitter Group, OT-11(V)2/GRC-169(V)	53E22C-3MW Transmitter Subsystem	2	777-1927-003
	15G1A-MW Klystron Power and Control Unit	1	787-6455-001
	27E8-MW Modulation Amplifier	1	758-5019-003
	23H2-MW AFC Unit	1	758-5410-001
	23K2-2MW AFC Reference Unit	1	777-1489-002
	52E22C-3MW Transmitter Plumbing Assembly	1	777-1929-003
Receiver Group, OR-22(V)3/GRC-169(V)	55E22E-4MW Receiver Subsystem	2	787-6458-023
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	22E2A-4MW IF. Amplifier	1	787-6456-004
	54E22E-4MW Receiver Plumbing Assembly	1	787-6457-004
Switching Group Electronic, OK-80(V)4/ GRC-169(V)	90C2-MW(MOD) Diversity Subsystem	1	607-1971-001
	12D2-MX Power Regulator	2	522-5033-003
	20F2-MW Diversity Combiner	2	758-5015-007
	18E2-MW Control Unit	1	758-5008-001
	78F1-MW Pilot/Noise Sensor	2	522-5623-004
	62E3-( )MW Pilot Oscillator	1	607-2048-001
	30A1-( )MW Pilot Converter	2	607-2051-001
	78G1-MW Alarm Unit	1	522-5705-003
	Subsystem Jackfield	1	
	Power Distribution Panel	1	607-1963-001
	Auxiliary Rack	1	607-1855-002
Power Distribution Group, OP-35(V)9/ GRC-169(V)	Power Distribution Group	1	774-4531-012
	19D1-MW DC Power Distribution Panel	1	758-5536-001
	Converter/Regulator Shelf	1	607-1942-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	THURSO STATION (Cont)		
	16N1-MW Power Converter	2	758-5544-001
	10-kHz LP Filter	1	796-2177-011
Control Monitor Group, OK-81(V)2/GRC-169(V)	Control Monitor Group	1	774-4518-002
	FA-102 Data Transmitter	1	518-906679-5
	73A1-FA Register and Data Indicator (red lens)	17	522-6654-053
	80D7-FA Card Cage	1	522-5386-024
	73A1-FA Register and Data Indicator (green lens)	6	522-6654-063
	80D1-FA Card Cage	1	522-6661-045
	68A1-FA Shift Pulse Generator	1	522-6651-016
	76A1-FA Register/Indicator Tester	2	522-6658-023
	68B2-FA Control Circuits	1	758-5156-003
	78A1-FA Tone-Off Control	3	522-6659-023
	60C1-36FA Tone Oscillator	1	777-1633-007
Telephone Terminal Group, OW-32(V)3/ GRC-169(V)	Telephone Terminal Group	1	616-0795-001
	Telephone Cradle Panel	1	607-7038-001
	90A1-MX(MOD) Audio Service Channel	1	607-1946-001
	20B1-MX Termination Unit	1	522-7547-004
	30A1-MX Modulator	1	522-7585-004
	30B1-MX Demodulator	1	522-7586-004
	51B1-MX Audio Amplifier	1	522-7548-005
	62E1-MX Oscillator	1	522-7587-004
	70A3-MX Extender	1	758-5806-001
	Card Cage	1	607-2070-001
	Headset	1	977-0047-000
	Handset	1	126-2434-020
Interconnect Group, ON-57(V)3/GRC-169(V)	Interconnecting Group	1	774-4511-003
	99G2-MW Coupling Subsystem	1	607-1929-001
	12A1-MW Power Regulator	2	522-5874-005
	24C2-MW Baseband Amplifier	4	522-5875-005

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	THURSO STATION (Cont)		
	26D3-1MX Preemphasis Network	1	522-5811-004
	26E3-1MX Deemphasis Network	1	522-5531-004
	78C2-MW Relay Unit	2	522-5882-004
	Jackfield	1	769-5140-001
Power Distribution Group, OP-35(V)10/ GRC-169(V)	Interconnect Group Power Supply	1	774-4531-013
	Shelf	1	796-4440-001
	16K1-MW Power Converter	2	758-5494-001
Interface Group, OU-79(V)1/UC	Technical Control Equipment	1	616-4041-001
	SF Rack	1	607-1855-003
Terminal Board Assembly, J-3012/UC	Pin Block Assembly	3	764-5198-001
Power Distribution Panel, SB-3578/UC	80G8-MX Power Distribution Panel	1	789-0448-005
Oscillator Distribution Group, OA-8629(V)1/ UC	Signal Oscillator Distribution Group	1	796-3943-001
	Card Cage (Posn 705)	1	607-1872-001
	16N1-MW Power Converter	2	758-5544-001
	Signal Tone Distribution Unit	1	566-6581-004
	60D1-2MX Signaling Oscillator	2	522-6467-003
	Converter Group	1	796-3941-001
	Card Cage (Posn 741)	1	607-2158-001
Signal Converter, CV-2856/UC	20J2-MX SF Signaling Unit	12	792-6238-001
	Card Cage (Posn 742-745)	4	607-2158-001
	Attenuator Group	2	796-3933-001
	Card Cage (Posn 760-761) each wired and equipped with 24 pads	1	796-2189-001
Variable Attenuator CN-1372/UC	0-31 dB Pad	24	796-2331-001
	Attenuator Group	1	796-3933-002
	Card Cage (Posn 762) wired for 24 and equipped with 12 pads	1	796-2189-001
Variable Attenuator CN-1372/UC	0-31 dB Pad	12	796-2331-001
	Circuit Patch Rack	1	607-1855-004
	Circuit Patch Jackfield	3	124-0057-434
	Circuit Patch Jackfield	2	124-0057-435

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	THURSO STATION (Cont)		
	VF Patch Rack	1	607-1855-005
	VF Jackfield	3	124-0057-432
	VF Jackfield	2	124-0057-433
	Operator Shelf	1	
Multiplexer Set, AN/UCC-4(V)	Multiplex Carrier Equipment (Government Furnished)	1	
Equalizer Group, OA-8370(V)	Equalizer Equipment mounted in a 7'6" rack (MT-2512)	1	
Frequency/Power Supply Group, OA-8373(V)	Frequency Generation and Power Supply Equipment mounted in a 7'6" rack (MT-2512)	1	
Multiplexer Group, OB-26(V)	Supergroup and Group Multiplex equipment mounted in a 7'6" rack (MT-2512)	1	
Multiplexer Group, OB-31(V)	Channel Multiplex equipment mounted in a 7'6" rack (MT 2512)	1	
	DC Power Plant	1	
	Battery Tray	1	
	Battery, Lead Calcium, Exide ETC-11	24	
	Equipment Rack, 19"	1	
	Transistor Counter EMF Cell, Power Conversion Products, Inc.	1	
	Inverter, DC to AC, Nova 2560-48	1	
	Inverter Relay Panel	1	
	Low-Voltage Disconnect Panel, Power Conversion Products, Inc.	1	
	Fuse Panel/Termination Panel/Ground Bar, Power Conversion Products, Inc.	1	
	Battery Charger Rack	1	
	50-Ampere Rectifier/Charger, Power Conversion Products, Inc., 3709C	2	
	Deluge Shower	1	
Antenna Radome, AS-2651/GR	Antenna Set	1	616-4022-001
	Antenna-Radome	1	616-0799-002

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	THURSO STATION (Cont)		
Waveguide Assembly, CG-3682/U	8-Foot Parabolic Antenna Dish, Andrew PL8-71G/S	1	124-0064-242
	8-Foot Tower Mount, Andrew T10	1	124-0064-234
	8-Foot Heated Radome, Andrew HR8E	1	124-0064-237
	Waveguide Assembly	1	616-0800-001
	Elliptical Waveguide Run, 150-ft., Andrew EWP-71	1	124-0064-228
	Waveguide Dehydrator, Andrew 1924-5	1	
	LATHERON STATION		
Radio Set AN/GRC-169(V)11	Microwave Repeater Station	1	607-1823-001
	MW-508D Remodulating Microwave Radio Set (Type I/II)	1	616-0796-002
	RF Rack 1	1	607-1860-001
Transmitter Group, OT-11(V)2/GRC-169(V)	53E22C-4MW Transmitter Subsystem	2	777-1927-004
	15G1A-MW Klystron Power and Control Unit	1	787-6455-001
	27E8-MW Modulation Amplifier	1	758-5019-003
	23H2-MW AFC Unit	1	758-5410-001
	23K2-2MW AFC Reference Unit	1	777-1489-002
	52E22C-4MW Transmitter Plumbing Assembly	1	777-1929-004
Receiver Group, OR-22(V)3/GRC-169(V)	55E22E-3MW Receiver Subsystem	2	787-6458-017
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	22E2A-4MW IF. Amplifier	1	787-6456-004
	54E22E-3MW Receiver Plumbing Assembly	1	787-6457-003
Switching Group Electronic, OK-80(V)4/ GRC-169(V)	90C2-MW(MOD) Diversity Subsystem	1	607-1971-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	LATHERON STATION (Cont)		
	12D2-MX Power Regulator	2	522-5033-003
	20F2-MW Diversity Combiner	2	758-5015-007
	18E2-MW Control Unit	1	758-5008-001
	78F1-MW Pilot/Noise Sensor	2	522-5623-004
	30A1-( )MW Pilot Converter	2	607-2051-001
	62E3-( )MW Pilot Oscillator	1	607-2048-001
	78G1-MW Alarm Unit	1	522-6705-003
	Subsystem Jackfield	1	
	Power Distribution Panel	1	607-1963-001
	RF Rack 2	1	607-1860-002
Amplifier Group, OG-56(V)3/GRC-169(V)	50F11-2MW TWT Power Amplifier Subsystem	1	787-6662-004
	15F4A-MW TWT Power Supply	1	787-6310-001
	78P2-MW Power Monitor	1	772-5148-001
	TWT Tray Assembly	1	793-0934-001
Transmitter Group, OT-11(V)2/GRC-169(V)	53E22C-4MW Transmitter Subsystem	1	777-1927-004
	15G1A-MW Klystron Power and Control Unit	1	787-6455-001
	27E8-MW Modulation Amplifier	1	758-5019-003
	23H2-MW AFC Unit	1	758-5410-001
	23K2-2MW AFC Reference Unit	1	777-1489-002
	52E22C-4MW Transmitter Plumbing Assembly	1	777-1929-004
Receiver Group, OR-22(V)3/GRC-169(V)	55E22E-3MW Receiver Subsystem	2	787-6458-017
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	22E2A-4MW IF. Amplifier	1	787-6456-004
	54E22E-3MW Receiver Plumbing Assembly	1	787-6457-003
Switching Group, Electronic, OK-80(V)4/GRC-169(V)	90C2-MW(MOD) Diversity Subsystem	1	607-1971-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	LATHERON STATION (Cont)		
	12D2-MX Power Regulator	2	522-5033-003
	20F2-MW Diversity Combiner	2	758-5015-007
	18E2-MW Control Unit	1	758-5008-001
	78F1-MW Pilot/Noise Sensor	2	522-5623-004
	30A1-( )MW Pilot Converter	2	607-2051-001
	62E3-( )MW Pilot Oscillator	1	607-2048-001
	78G1-MW Alarm Unit	1	522-5705-003
	Subsystem Jackfield	1	
	Power Distribution Panel	1	607-1963-001
	RF Rack 3	1	607-1860-003
Amplifier Group, OG-56(V)3/GRC-169(V)	50F11-2MW TWT Power Amplifier Subsystem	1	787-6662-004
	15F4A-MW TWT Power Supply	1	787-6310-001
	78P2-MW Power Monitor	1	772-5148-001
	TWT Tray Assembly	1	793-0934-004
Transmitter Group, OT-11(V)2/GRC-169(V)	53E22C-4MW Transmitter Subsystem	1	777-1927-004
	15G1A-MW Klystron Power and Control Unit	1	787-6455-001
	27E8-MW Modulation Amplifier	1	758-5019-003
	23H2-MW AFC Unit	1	758-5410-001
	23K2-2MW AFC Reference Unit	1	777-1489-002
	52E22C-4MW Transmitter Plumbing Assembly	1	777-1929-004
Receiver Group, OR-22(V)3/GRC-169(V)	55E22E-3MW Receiver Subsystem	2	787-6458-017
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	22E2A-4MW IF. Amplifier	1	787-6456-004
	54E22E-3MW Receiver Plumbing Assembly	1	787-6457-003
Switching Group Electronic, OK-80(V)4/ GRC-169(V)	90C2-MW(MOD) Diversity Subsystem	1	607-1971-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	LATHERON STATION (Cont)		
	12D2-MX Power Regulator	2	522-5033-003
	20F2-MW Diversity Combiner	2	758-5015-007
	18E2-MW Control Unit	1	758-5008-001
	78F1-MW Pilot/Noise Sensor	2	522-5623-004
	30A1-( )MW Pilot Converter	2	607-2051-001
	62E3-( )MW Pilot Oscillator	1	607-2048-001
	78G1-MW Alarm Unit	1	522-5705-003
	Subsystem Jackfield	1	
	Power Distribution Panel	1	607-1963-001
	Aux Rack	1	607-1860-004
Power Distribution Group, OP-35(V)11/ GRC-169(V)	Power Distribution Group	1	774-4531-014
	19D1-MW DC Power Distribution Panel	1	758-5536-001
	Converter/Regulator Shelf	1	607-1942-001
	16N1-MW Power Converter	2	758-5544-001
	10-kHz LP Filter	1	796-2177-011
	3-kHz LP Filter	1	796-2177-010
Control Monitor Group, OK-81(V)3/GRC-169(V)	Control Monitor Group	1	774-4518-003
	FA-102 Data Transmitter	1	518-906679-5
	73A1-FA Register and Data Indicator (red lens)	17	522-6654-053
	73A1-FA Register and Data Indicator (green lens)	6	522-6654-063
	68A1-FA Shift Pulse Generator	1	522-6651-016
	68B2-FA Transmitter Control Circuits	1	758-5156-003
	60C1-34FA Tone Oscillator	1	777-1633-003
	80D1-FA Card Cage	1	522-6661-045
	76A1-FA Register/Indicator Tester	2	522-6658-023
	80D7-FA Card Cage	1	522-5386-024
	78A1-FA Tone-Off Control	3	522-6659-023
	Blank Panel	1	762-0608-032

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	LATHERON STATION (Cont)		
Telephone Terminal Group, OW-32(V)3/ GRC-169(V)	Telephone Terminal Group	1	616-0795-001
	Telephone Cradle Panel	1	607-7038-001
	90A1-MX(MOD) Audio Service Channel	1	607-1946-001
	20B1-MX Termination Unit	1	522-7547-004
	30A1-MX Modulator	1	522-7585-004
	30B1-MX Demodulator	1	522-7586-004
	51B1-MX Audio Amplifier	1	522-7548-004
	62E1-MX Oscillator	1	522-7587-004
	70A3-MX Extender	1	758-5806-001
	Card Cage	1	607-2070-001
	Headset	1	977-0047-000
	Handset	1	126-2434-020
Interconnect Group, ON-57(V)4/GRC-169(V)	Interconnecting Group	1	774-4511-004
	99G2-MW Coupling Subsystem	2	607-1929-001
	12A1-MW Power Regulator	2	522-5874-005
	24C2-MW Baseband Amplifier	4	522-5875-005
	26D3-1MX Preemphasis Network	1	522-5811-004
	26E3-1MX Deemphasis Network	1	522-5531-004
	78C2-MW Relay Unit	2	522-5882-004
	Jackfield	2	769-5140-001
Power Distribution Group, OP-35(V)13/ GRC-169(V)	Power Distribution Group	1	774-4531-015
	Shelf	1	796-4440-001
	16K1-MW Power Converter	4	758-5494-001
	DC Power Plant	1	
	Battery Tray	1	
	Battery, Lead Calcium, Exide ETC-9	24	
	Battery Charger Rack	1	
	50 Amp Rectifier/Charger, Power Conversion Products, Inc., 3709C	2	
	Equipment Rack, 19"	1	

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	LATHERON STATION (Cont)		
	Transistor Counter EMF Cell, Power Conversion Products, Inc.	1	
	Low-Voltage Disconnect Panel, Power Conversion Products, Inc.	1	
	Fuse Panel, Termination Panel and Ground Bar, Power Conversion Products, Inc.	1	
	Deluge Shower	1	
Antenna Set, OE-118(V)1/GR	Antenna Set	1	616-4022-002
Antenna Radome Set, AS-2651/GR	Antenna Radome Set	1	616-0799-002
	8-Foot Parabolic Antenna Dish, Andrew PL8-71G/S	1	124-0064-242
	8-Foot Tower Mount, Andrew T10	1	124-0064-234
	8-Foot Heated Radome, Andrew HR8E	1	124-0064-237
	2-Port Manifold, Andrew 6600A-2	1	
Antenna Radome Set, AS-2654/GR	Antenna-Radome Set	2	616-0799-005
	12-Foot Parabolic Antenna Dish, Andrew PXL12-71G/S	1	124-0064-243
	12-Foot Tower Mount, Andrew T12B	1	124-0064-235
	12-Foot Heated Radome, Andrew HR12D	1	124-0064-238
Waveguide Assembly, CG-3682/U	Waveguide Assembly	1	607-0800-002
	Elliptical Waveguide, 75 ft, Andrew EWP-71	1	124-0064-228
Waveguide Assembly, CG-3682/U	Waveguide Assembly	1	616-0800-003
	Elliptical Waveguide, 225 ft, Andrew EWP-71	1	124-0064-228
Waveguide Assembly, CG-3682/U	Waveguide Assembly	2	616-0800-004
	Elliptical Waveguide, 35 ft, Andrew EWP-71	1	124-0064-228
Waveguide Assembly, CG-3683/U	Waveguide Assembly	2	616-0800-005
	Elliptical Waveguide, 30 ft, Andrew EWP-71	1	124-0064-228

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	LATHERON STATION (Cont)		
Waveguide Assembly, CG-3684/U	Waveguide Assembly	1	616-4021-001
	Circular Waveguide, 320 ft, Andrew WC-166	1	124-0064-219
	Circular Waveguide, 10 ft, Andrew WC-166	1	124-0064-220
	Waveguide Dehydrator, Andrew 1924-5	1	
	Transportable Radio Shelter, modified S-280 radio equipment shelter	1	
	Emergency-Generator Shelter, Standard S-280 engine-generator shelter	1	
	MORMOND HILL STATION		
	Microwave Repeater Station (With baseband drops to interface with an existing Air Force Troposcatter System)	1	607-1825-001
Radio Set AN/GRC-169(V)12	MW-508D Remodulating Microwave Radio Set (Type I)	1	616-0796-003
	RF Rack 1	1	607-1865-001
	Power Distribution Panel	1	607-1963-001
Transmitter Group, OT-11(V)2/GRC-169(V)	53E22C-3MW Transmitter Subsystem	2	777-1927-003
	15G1A-MW Klystron Power and Control Unit	1	787-6455-001
	27E8-MW Modulation Amplifier	1	758-5019-003
	23H2-MW AFC Unit	1	758-5410-001
	23K2-2MW AFC Reference Unit	1	777-1489-002
	52E22C-3MW Transmitter Plumbing Assembly	1	777-1929-003
Receiver Group, OR-22(V)3/GRC-169(V)	55E22E-4MW Receiver Subsystem	2	787-6458-023
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	51G1-MW 70-MHz Mixer-Amplifier	1	787-6459-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	MORMOND HILL STATION (Cont)		
	22E2A-4MW IF. Amplifier	1	787-6456-004
	54E22E-4MW Receiver Plumbing Assembly	1	787-6457-004
Switching Group Electronic, OK-80(V)4/ GRC-169(V)	90C2-MW(MOD) Diversity Subsystem	1	607-1971-001
	12D2-MX Power Regulator	2	522-5033-003
	20F2-MW Diversity Combiner	2	758-5015-007
	18E2-MW Control Unit	1	758-5008-001
	78F1-MW Pilot/Noise Sensor	2	522-5623-004
	62E3-( )MW Pilot Oscillator	1	607-2048-001
	30A1-( )MW Pilot Converter	2	607-2051-001
	78G1-MW Alarm Unit	1	522-5705-003
	Subsystem Jackfield	1	
	RF Rack 2	1	607-1865-002
	Power Distribution Panel	1	607-1963-001
Amplifier Group, OG-56(V)3/GRC-169(V)	50F11-1MW TWT Power Amplifier Subsystem	1	787-6662-003
	15F4A-MW TWT Power Supply	1	787-6310-001
	78P2-MW Power Monitor	1	772-5148-001
	TWT Tray Assembly	1	793-0934-003
Transmitter Group, OT-11(V)2/GRC-169(V)	53E22C-3MW Transmitter Subsystem	1	777-1927-003
	15G1A-MW Klystron Power and Control Unit	1	787-6455-001
	27E8-MW Modulation Amplifier	1	758-5019-003
	23H2-MW AFC Unit	1	758-5410-003
	23K2-2MW AFC Reference Unit	1	777-1489-002
	52E22C-3MW Transmitter Plumbing Assembly	1	777-1929-003
Receiver Group, OR-22(V)3/GRC-169(V)	55E22E-4MW Receiver Subsystem	2	787-6458-023
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	22E2A-4MW IF. Amplifier	1	787-6456-004

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	MORMOND HILL STATION (Cont)		
	54E22E-4MW Receiver Plumbing Assembly	1	787-6457-004
Switching Group Electronic, OK-80(V)4/ GRC-169(V)	90C2-MW(MOD) Diversity Subsystem	1	607-1971-001
	12D2-MX Power Regulator	2	522-5033-003
	20F2-MW Diversity Combiner	2	758-5015-003
	18E2-MW Control Unit	1	758-5008-001
	78F1-MW Pilot/Noise Sensor	2	522-5623-004
	30A1-( )MW Pilot Converter	2	607-2051-001
	62E3-( )MW Pilot Oscillator	1	607-2048-001
	78G1-MW Alarm Unit	1	522-5705-003
	Subsystem Jackfield	1	
	RF Rack 3	1	607-1865-003
	Same as RF Rack 2		
	Aux Rack	1	607-1865-004
Power Distribution Group, OP-35(V)11/ GRC-169(V)	Power Distribution Group	1	774-4531-014
	19D1-MW Power Distribution	1	758-5536-001
	Converter/Regulator Shelf	1	607-1942-001
	16N1-MW Power Converter Unit	2	758-5544-001
	10-kHz LP Filter	1	796-2177-011
	3-kHz LP Filter	1	796-2177-010
Control Monitor Group, OK-81(V)4/GRC-169(V)	Control Monitor Group	1	774-4518-004
	FA-102 Data Transmitter	1	518-906679-5
	73A1-FA Register and Data Indicator (red lens)	17	522-6654-053
	73A1-FA Register and Data Indicator (green lens)	6	522-6654-063
	68A1-FA Shift Pulse Generator	1	522-6651-016
	68B2-FA Transmitter Control Circuits	1	758-5156-003
	60C1-27FA Tone Oscillator	1	522-6716-024
	76A1-FA Register/Indicator Tester	2	522-6658-023
	80D1-FA Card Cage	1	522-6661-045

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	MORMOND HILL STATION (Cont)		
	78A1-FA Tone-Off Control	3	522-6659-023
	80D7-FA Card Cage	1	522-5386-024
Telephone Terminal Group, OW-32(V)3/ GRC-169(V)	Telephone Terminal Group		616-0795-001
	Telephone Cradle Panel	1	607-7038-001
	90A1-MX(MOD) Audio Service Channel	1	607-1946-001
	20B1-MX Termination Unit	1	522-7547-004
	30A1-MX Modulator	1	522-7585-004
	30B1-MX Demodulator	1	522-7586-004
	51B1-MX Audio Amplifier	1	522-7548-004
	62E1-MX Oscillator	1	522-7587-004
	70A3-MX Extender	1	758-5806-001
	Card Cage	1	607-2070-001
	Headset	1	977-0047-000
	Handset	1	126-2434-020
Interconnect Group, ON-57(V)3/GRC-169(V)	Interconnecting Group	2	774-4511-003
	99G2-MW Coupling Subsystem	2	607-1929-001
	12A1-MW Power Regulator	2	522-5874-005
	24C2-MW Baseband Amplifier	4	522-5875-005
	26D3-1MX Preemphasis Network	1	522-5811-004
	26E3-1MX Deemphasis Network	1	522-5531-004
	78C2-MW Relay Unit	2	522-5882-004
	Jackfield	2	769-5140-001
	27F2-MX Baseband Patching Unit	1	522-6524-003
Power Distribution Group, OP-35(V)12/ GRC-169(V)	Power Distribution Group	1	774-4531-015
	Shelf	1	796-4440-001
	16K1-MW Power Converter	4	758-5494-002
	4 Way/4 Wire Bridge	1	126-2329-110
	DC Power Plant	1	
	Battery Tray	1	
	Battery, Lead Calcium, Exide ETC-9	24	

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	MORMOND HILL STATION (Cont)		
	Battery Charger Rack, standard 19" equipment rack	1	
	50-Ampere Rectifier/Charger, Power Conversion Products, Inc., 3709C	2	
	Equipment Rack, 19"	1	
	Transistor Counter EMF Cell, Power Conversion Products, Inc.	1	
	Low-Voltage Disconnect Panel, Power Conversion Products, Inc.	1	
	Fuse Panel, Termination Panel and Ground Bar, Power Conversion Products, Inc.	1	
	Deluge Shower	1	
Antenna Set OE-118(V)2/GR	Antenna Set	1	616-4022-003
Antenna Radome Set, AS-2652/GR	Antenna Radome Set	1	616-0799-003
	10-Foot Parabolic Dish, Andrew PXL10-71G/S	1	124-0064-244
	10-Foot Tower Mount, Andrew T10	1	124-0064-234
	10-Foot Heated Radome, Andrew HR10E	1	124-0064-239
Antenna Radome Set AS-2654/GR	Antenna-Radome Set	2	616-0799-005
	12-Foot Parabolic Dish, Andrew PZL12-71G/S	1	124-0064-243
	12-Foot Tower Mount, Andrew T12B	1	124-0064-235
	12-Foot Heated Radome, Andrew HR12D	2	124-0064-238
Waveguide Assembly, CG-3682/U	Waveguide Assembly	2	607-0800-006
	Elliptical Waveguide, 300 ft, Andrew EWP-71	1	124-0064-228
	Waveguide Dehydrator, Andrew 1924-5	1	
Waveguide Assembly, CG-3682/U	Waveguide Assembly	2	607-0800-007
	Elliptical Waveguide, 115 ft, Andrew EWP-71	1	124-0064-228

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	MORMOND HILL STATION (Cont)		
Waveguide Assembly, CG-3683/U	Waveguide Assembly	2	607-0800-005
	Elliptical Waveguide, 30 ft, Andrew EWP-71	1	124-0064-228
Waveguide Assembly, CG-3684/U	Waveguide Assembly	1	616-4021-001
	Circular Waveguide, 320 ft, Andrew WC-166	1	124-0064-219
	Circular Waveguide, 10 ft, Andrew WC-166	1	124-0064-220
	Waveguide Dehydrator, Andrew 1924-5	1	
	4-Port Manifold, Andrew 6600A-4	1	
	ABERDEEN STATION		
	Microwave Repeater Station		607-1827-001
Radio Set AN/GRC-169(V)13	MW-509E Heterodyne Microwave Radio Set (Type IIA)	1	616-0796-004
	RF Rack 1	1	607-1870-001
	Power Distribution Panel	1	607-1963-001
Amplifier Group, OG-56(V)3/GRC-169(V)	50F11-2MW TWT Power Amplifier Subsystem	2	787-6662-004
	15F4A-MW TWT Power Supply	1	787-6310-001
	78P2-MW Power Monitor	1	772-5148-001
	TWT Tray Assembly	1	793-0934-004
Converter Group, OU-37(V)2/GRC-169(V)	65F1A-2MW Transmit Converter Subsystem	2	792-6142-014
	16L1A-MW Transmit Power and Control Unit	1	758-5569-004
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	40S2-MW Pad	1	758-5606-002
	Patching Jackfield	1	
	Transmitter Plumbing Assembly	1	793-0889-008
	51F3-MW 70-MHz Amplifier	1	777-1739-002

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	ABERDEEN STATION (Cont)		
Receiver Group, OR-22(V)4/GRC-169(V)	55F30A-1MW Receiver Subsystem	2	758-5755-014
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	40M2-MW RF Equalizer	1	758-5509-003
	40M3-MW System Equalizer	1	772-5146-001
	40L2-5MW IF. Filter	1	772-5147-005
	20H1-MW ACG Amplifier	1	758-5504-002
	29A1-MW Limiter	1	758-5506-002
	29B1-MW Discriminator	1	758-5507-002
	62B3-MW 70-MHz Quieting Oscillator	1	772-5284-001
	Receiver Plumbing Assembly	1	793-0850-003
	RF Rack 2	1	607-1870-002
	Same as RF Rack 1		
	Aux Rack	1	607-1870-003
Power Distribution Group, OP-35(V)13/GRC-169(V)	Power Distribution Group	1	774-4531-016
	19D1-MW Power Distribution Panel	1	758-5536-001
	Converter/Regulator Shelf	1	607-1942-001
	16N1-MW Power Converter	2	758-5544-001
	24H1-MW Amplifier	1	758-5332-001
	10-kHz LP Filter	1	796-2177-011
	3-kHz LP Filter	1	796-2177-010
	Card Cage (Posn 79)	1	607-1959-001
	40B1-MW Combiner Network	1	522-6640-003
Control Monitor Group, OK-81(V)5/GRC-169(V)	Control Monitor Group	1	774-4518-005
	FA-102 Data Transmitter	1	518-906679-5
	73A1-FA Register and Data Indicator (red lens)	17	522-6654-053
	73A1-FA Register and Data Indicator (green lens)	6	522-6654-063

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	ABERDEEN STATION (Cont)		
Telephone Terminal Group, OW-32(V)3/ GRC-169(V)	68A1-FA Shift Pulse Generator	1	522-6651-016
	68B2-FA Transmitter Control Circuits	1	758-5154-003
	60C1-25FA Tone Oscillator	1	522-6714-024
	76A1-FA Register/Indicator Tester	2	522-6658-023
	78A1-FA Tone-Off Control	3	522-6659-023
	80D1-FA Card Cage	1	522-6661-045
	80D7-FA Card Cage	1	522-5386-024
	Blank Panel	1	762-0608-032
	Telephone Terminal Group	1	616-0795-001
	Telephone Cradle Panel	1	607-7038-001
	90A1-MX(MOD) Audio Service Channel	1	607-1946-001
	20B1-MX Termination Unit	1	522-7547-004
	30A1-MX Modulator	1	522-7585-004
	30B1-MX Demodulator	1	522-7586-004
	51B1-MX Audio Amplifier	1	522-7548-004
	62E1-MX Oscillator	1	522-7587-004
	70A3-MX Extender	1	758-5806-001
	Card Cage	1	607-2070-001
	Headset	1	977-0047-000
	Handset	1	126-2434-020
	DC Power Plant	1	
	Battery Tray	1	
	Battery, Lead Calcium, Exide ETC-7	24	
	Battery Charger Rack, standard 19" equipment rack	1	
	50-Ampere Rectifier/Charger, Power Conversion Products, Inc., 3709C	2	
	Equipment Rack, 19"	1	
	Transistor Counter EMF Cell, Power Conversion Products, Inc.	1	

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	ABERDEEN STATION (Cont)		
	Low-Voltage Disconnect Panel, Panel Conversion Products, Inc.	1	
	Fuse Panel, Termination Panel and Ground Bar, Power Conversion Products, Inc.	1	
	Deluge Shower	1	
Antenna Set, OE-118(V)3/GR	Antenna Set	1	616-4022-004
Antenna Radome Set, AS-2650/GR	Antenna-Radome Set	1	616-0799-001
	6-Foot Parabolic Dish, Andrew PL6-71G/S	1	124-0064-245
	6-Foot Tower Mount, Andrew T4B	1	124-0064-236
	6-Foot Heated Radome, Andrew HR6C	1	124-0064-240
Antenna Radome Set, AS-2653/GR	Antenna-Radome Set	1	616-0799-004
	12-Foot Parabolic Dish, Andrew PZL12-71G/S	1	124-0064-246
	12-Foot Tower Mount, Andrew T12B	1	124-0064-235
	12-Foot Heated Radome, Andrew HR12D	1	124-0064-238
Waveguide Assembly, CG-3682/U	Waveguide Assembly	1	616-0800-008
	Elliptical Waveguide, 60 ft, Andrew EWP-71	1	124-0064-228
Waveguide Assembly, CG-3682/U	Waveguide Assembly	1	616-0800-009
	Elliptical Waveguide, 45 ft, Andrew EWP-71	1	124-0064-228
	Waveguide Dehydrator, Andrew 1924-5	1	
	2-Port Manifold, Andrew 6600A-2		
	Transportable Radio Shelter, modified S-280 radio equipment shelter	1	
	Emergency-Generator Shelter, standard S-280 engine-generator shelter	1	

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	INVERBERVIE STATION		
	Microwave Repeater Station		607-1829-001
Radio Set, AN/GRC-169(V)14	MW-509E Heterodyne Microwave Radio Set (Type IIA)	1	616-0795-005
	RF Rack 1	1	607-1875-001
	Power Distribution Panel	1	607-1963-001
Amplifier Group, OG-56(V)3/GRC-169(V)	50F11-1MW TWT Power Amplifier Subsystem	2	787-6662-003
	15F4A-MW TWT Power Supply	1	787-6310-001
	78P2-MW Power Monitor	1	772-5148-001
	TWT Tray Assembly	1	793-0934-003
Converter Group, OU-37(V)2/GRC-169(V)	65F1A-1MW Transmit Converter Subsystem	2	792-6142-010
	16L1A-1MW Transmit Power and Control Unit	1	758-5569-004
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	40S2-MW Pad	1	758-5606-002
	Patching Jackfield	1	
	Transmitter Plumbing Assembly	1	793-0889-007
	51F3-MW 70-MHz Amplifier	1	777-1739-002
Receiver Group, OR-22(V)4/GRC-169(V)	55F30A-2MW Receiver Subsystem	2	758-5755-016
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	40M2-MW RF Equalizer	1	758-5509-003
	40M3-MW System Equalizer	1	772-5146-001
	40L2-5MW IF. Filter	1	772-5147-005
	20H1-MW AGC Amplifier	1	758-5504-002
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	29A1-MW Limiter	1	758-5506-002
	29B1-MW Discriminator	1	758-5507-002

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	INVERBERVIE STATION (Cont)		
	62B3-MW 70-MHz Quieting Oscillator	1	772-5284-001
	Receiver Plumbing Assembly	1	793-0850-004
	RF Rack 2	1	607-1875-002
	Same as RF Rack 1		
	Aux Rack	1	607-1875-003
Power Distribution Group, OP-35(V)13/ GRC-169(V)	Power Distribution Group		774-4531-016
	19D1-MW Power Distribution Panel	1	758-5536-001
	Converter/Regulator Shelf	1	607-1942-001
	16N1-MW Power Converter	2	758-5544-001
	24H1-MW Amplifier	1	758-5332-001
	10-kHz LP Filter	1	796-2177-011
	3-kHz LP Filter	1	796-2177-010
	Card Cage (Posn 79)	1	607-1959-001
	40B1-MW Combiner Network	1	522-6640-003
Control Monitor Group, OK-81(V)6/GRC-169(V)	Control Monitor Group	1	774-4518-006
	FA-102 Data Transmitter	1	518-906679-5
	73A1-FA Register and Data Indicator (red lens)	17	522-6654-053
	73A1-FA Register and Data Indicator (green lens)	6	522-6654-063
	68A1-FA Shift Pulse Generator	1	522-6651-016
	68B2-FA Transmitter Control Circuits	1	758-5156-003
	60C1-23FA Tone Oscillator	1	522-6712-024
	76A1-FA Register/Indicator Tester	2	522-6658-023
	78A1-FA Tone-Off Control	3	522-6659-023
	80D1-FA Card Cage	1	522-6661-045
	80D7-FA Card Cage	1	522-5386-024
	Blank Panel	1	762-0608-032
Telephone Terminal Group, OW-32(V)3/ GRC-169(V)	Telephone Terminal Group		616-0795-001
	Telephone Cradle Panel	1	607-7038-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	INVERBERVIE STATION (Cont)		
	90A1-MX(MOD) Audio Service Channel	1	607-1946-001
	20B2-MX Termination Unit	1	522-7547-004
	30A1-MX Modulator	1	522-7585-004
	30B1-MX Demodulator	1	522-7586-004
	51B1-MX Audio Amplifier	1	522-7548-004
	62E1-MX Oscillator	1	522-7587-004
	70A3-MX Extender	1	758-5806-001
	Card Cage	1	607-2070-001
	Headset	1	977-0047-000
	Handset	1	126-2434-020
	DC Power Plant	1	
	Battery Tray	1	
	Battery, Lead Calcium, Exide ETC-7	24	
	Battery Charger Rack, standard 19" equipment rack	1	
	50-Ampere Rectifier/Charger, Power Conversion Products, Inc., 3709C	2	
	Equipment Rack, 19"	1	
	Transistor Counter EMF Cell, Power Conversion Products, Inc.	1	
	Low-Voltage Disconnect Panel, Power Conversion Products, Inc.	1	
	Fuse Panel/Termination Panel/Ground Bar, Power Conversion Products, Inc.	1	
	Deluge Shower	1	
Antenna Set, OE-118(V)4/GR	Antenna Set	1	616-4022-005
Antenna Radome Set AS-2650/GR	Antenna-Radome Set	1	616-0799-001
	6-Foot Parabolic Dish, Andrew PL6-71G/S	2	124-0064-245
	6-Foot Tower Mount, Andrew T4B	2	124-0064-236
	6-Foot Heated Radome, Andrew HR6C	2	124-0064-240

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	INVERBERVIE STATION (Cont)		
Waveguide Assembly, CU-3682/U	Waveguide Assembly	1	616-0800-010
	Elliptical Waveguide, 80 ft, Andrew EWP-71	1	124-0064-228
Waveguide Assembly, CU-3682/U	Waveguide Assembly	1	616-0800-011
	Elliptical Waveguide, 125 ft, Andrew EWP-71	1	124-0064-228
	Waveguide Dehydrator, Andrew 1924-5	1	
	2-Port Manifold, Andrew 6600A-2	1	
	Transportable Radio Shelter, modified S-280 radio equipment shelter	1	
	Emergency-Generator Shelter, standard S-280 engine-generator shelter	1	
	KINNABER STATION		
	3-Way Junction Microwave Repeater Station		607-1831-001
Radio Set, AN/GRC-169(V)15	MW-509E/MW-508D Microwave Radio Sets (Type IA/I)	1	616-0796-006
	RF Rack 1	1	607-1880-001
	Power Distribution Panel	1	607-1963-001
Amplifier Group, OG-56(V)3/GRC-169(V)	50F11-2MW TWT Power Amplifier Subsystem	2	787-6662-004
	15F4A-MW TWT Power Supply	1	787-6310-001
	78P2-MW Power Monitor	1	772-5148-001
	TWT Tray Assembly	1	793-0934-004
Converter Group, OU-37(V)2/GRC-169(V)	65F1A-2MW Transmit Converter Subsystem	2	792-6142-014
	16L1A-MW Transmit Power and Control Unit	1	758-5569-004
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	40S2-MW Pad	1	758-5606-002
	Patching Jackfield	1	

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	KINNABER STATION (Cont)		
	Transmitter Plumbing Assembly	1	793-0889-008
	51F3-MW 70-MHz Amplifier	1	777-1739-002
Receiver Group, OR-22(V)4/GRC-169(V)	55F30A-1MW Receiver Subsystem	2	758-5755-014
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	40M2-MW RF Equalizer	1	758-5509-003
	40M3-MW System Equalizer	1	772-5146-001
	40L2-5MW IF. Filter	1	772-5147-005
	20H1-MW AGC Amplifier	1	758-5504-002
	29A1-MW Limiter	1	758-5506-002
	29B1-MW Discriminator	1	758-5507-002
	62B3-MW 70-MHz Quieting Oscillator	1	772-5284-001
	Receiver Plumbing Assembly	1	793-0850-003
	Aux Rack 1	1	607-1880-002
	Power Distribution Panel	1	607-1963-001
Dual Transmitter Group, OZ-3(V)2/GRC-169(V)	35A1-MW FM Transmitter Subsystem	1	758-5537-010
	16N1-MW Power Converter	2	758-5544-001
	23H3-MW AFC Unit	2	758-5502-001
	62G1-MW FM Generator	2	758-5212-001
	Patching Jackfield	1	
Switching Group Electronic, OK-80(V)4/ GRC-169(V)	90C2-MW(MOD) Diversity Subsystem	1	607-1971-001
	12D2-MX Power Regulator	2	522-5033-003
	20F2-MW Diversity Combiner	2	758-5015-007
	18E2-MW Control Unit	1	758-5008-001
	78F1-MW Pilot/Noise Sensor	2	522-5623-004
	30A1-( )MW Pilot Converter	2	607-2051-001
	62E3-( )MW Pilot Oscillator	1	607-2048-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	KINNABER STATION (Cont)		
	78G1-MW Alarm Unit	1	522-5705-003
	Patching Jackfield	1	
	4-Way/4-Wire Bridge	1	126-2329-110
Interconnect Group, ON-57(V)5/GRC-169(V)	Interconnecting Group (Posn 50 and 35)	1	774-4511-005
	99G2-MW Coupling Subsystem	1	607-1929-001
	12A1-MW Power Regulator	2	522-5874-005
	24C2-MW Baseband Amplifier	4	522-5875-005
	26D3-1MX Preemphasis Network	1	522-5811-004
	26E3-1MX Deemphasis Network	1	522-5531-004
	78C2-MW Relay Unit	2	522-5882-004
	Jackfield	1	769-5140-001
Interconnect Group, ON-57(V)6/GRC-169(V)	Interconnecting Group (Posn 54 and 36) Same as Interconnect Group ON-57(V)5/GRC-169(V)	1	774-4511-006
Interconnect Group, ON-57(V)7/GRC-169(V)	Interconnecting Group (Posn 55 and 37) Same as Interconnect Group ON-57(V)5/GRC-169(V)	1	774-4511-007
Power Distribution Group, OP-35(V)12/GRC-169(V)	Power Distribution Group	1	774-4531-015
	Interconnect Group Power Supply (Posn 53)	1	796-4440-001
	16K1-MW Power Converter	4	758-5494-001
Power Distribution Group, OP-35(V)10/GRC-169(V)	Power Distribution Group	1	774-4531-013
	Interconnect Group Power Supply (Posn 57)	1	796-4440-001
	16K1-MW Power Converter	2	758-5494-002
	RF Rack 2	1	607-1880-003
	Power Distribution Panel	1	607-1963-001
Transmitter Group, OT-11(V)2/GRC-169(V)	53E22C-4MW Transmitter Subsystem	2	777-1927-004
	15G1A-MW Klystron Power and Control Unit	1	787-6455-001
	27E8-MW Modulation Amplifier	1	758-5019-003

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	KINNABER STATION (Cont)		
	23H2-MW AFC Unit	1	758-5410-001
	23K2-2MW AFC Reference Unit	1	777-1489-002
	52E22C-4MW Transmitter Plumbing Assembly	1	777-1929-004
Receiver Group, OR-22(V)3/GRC-169(V)	55E22E-3MW Receiver Subsystem	2	787-6458-017
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	22E2A-4MW IF. Amplifier	1	787-6456-004
	54E22E-3MW Receiver Plumbing	1	787-6457-003
Switching Group Electronic, OK-80(V)4/GRC-169(V)	90C2-MW(MOD) Diversity Subsystem	1	607-1971-001
	19D2-MX Power Regulator	2	522-5033-003
	20F2-MW Diversity Combiner	2	758-5015-007
	18E2-MW Control Unit	1	758-5008-001
	78F1-MW Pilot/Noise Sensor	2	522-5623-004
	30A1-( )MW Pilot Converter	2	607-2051-001
	62E3-( )MW Pilot Oscillator	1	607-2048-001
	78G1-MW Alarm Unit	1	522-5705-003
	Subsystem Jackfield	1	
	RF Rack 3	1	607-1880-004
	Same as RF Rack 2		
	Aux Rack 2	1	607-1880-005
Power Distribution Group, OP-35(V)14/ GRC-169(V)	Power Distribution Group	1	774-4531-017
	19D1-MW DC Power Distribution Panel	1	607-5536-001
	Converter/Regulator Shelf	1	607-1942-001
	16N1-MW Power Converter	2	758-5544-001
	24H1-MW Amplifier	2	758-5332-001
	10-kHz LP Filter	1	796-2177-011
	3-kHz LP Filter	1	796-2177-010

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	KINNABER STATION (Cont)		
Control Monitor Group, OK-81(V)7/GRC-169(V)	Control Monitor Group	1	774-4518-007
	FA-102 Data Transmitter	1	518-906679-5
	73A1-FA Register and Data Indicator (red lens)	17	522-6654-053
	80D7-FA Card Cage	1	522-5386-024
	73A1-FA Register and Data Indicator (green lens)	6	522-6654-063
	68A1-FA Shift Pulse Generator	1	522-6651-016
	68B2-FA Control Circuits	1	758-5156-003
	60C1-18FA Tone Oscillator	1	522-6707-024
	76A1-FA Register/Indicator Tester	2	522-6658-023
	78A1-FA Tone-Off Control	3	522-6659-023
	80D1-FA Card Cage	1	522-6661-045
	Blank Panel	1	762-0608-032
Telephone Terminal Group, OW-32(V)3/ GRC-169(V)	Telephone Terminal Group	1	616-0795-001
	Telephone Cradle Panel	1	607-7038-001
	90A1-MX(MOD) Audio Service Channel	1	607-1946-001
	20B1-MX Termination Unit	1	522-7547-004
	30A1-MX Modulator	1	522-7585-004
	30B1-MX Demodulator	1	522-7586-004
	51B1-MX Audio Amplifier	1	522-7548-005
	62E1-MX Oscillator	1	522-7587-004
	70A3-MX Extender	1	758-5806-001
	Card Cage	1	607-2070-001
	Headset	1	977-0047-000
	Handset	1	126-2434-020
	DC Power Plant	1	
	Battery Tray	1	
	Battery, Lead-Calcium Exide ETC-13	24	

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	KINNABER STATION (Cont)		
	Battery Charger Rack, standard 19" equipment rack	2	
	100-Ampere Rectifier/Charger, Power Conversion Products, Inc., 3711C	1	
	Equipment Rack, 19"	1	
	Transistor Counter EMF Cell, Power Conversion Products, Inc.	1	
	Low-Voltage Disconnect Panel, Power Conversion Products, Inc.	1	
	Fuse Panel/Termination Panel Ground Bar, Power Conversion Products, Inc.	1	
	Deluge Shower	1	
Antenna Set, OE-118(V)5/GR	Antenna Set	1	616-4022-006
Antenna Radome Set, AS-2650/GR	Antenna-Radome Set	3	616-0799-001
	6-Foot Parabolic Dish, Andrew PL6-71G/S	1	124-0064-245
	6-Foot Tower Mount, Andrew T4B	1	124-0064-236
	6-Foot Heated Radome, Andrew HR6C	1	124-0064-240
Waveguide Assembly, CU-3682/U	Waveguide Assembly	2	616-0800-012
	Elliptical Waveguide, 240 ft, Andrew EWP-71	1	124-0064-228
Waveguide Assembly CU-3682/U	Waveguide Assembly	1	616-0800-013
	Elliptical Waveguide, 190 ft, Andrew EWP-71	1	124-0064-228
	Waveguide Dehydrator, Andrew 1924-5	1	
	3-Port Manifold, Andrew 6600A-3	1	
	EDZELL STATION		
	Microwave Terminal Station		607-1833-001
Radio Set, AN/GRC-169(V)16	MW-508D Remodulating Microwave	1	616-0796-007

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	EDZELL STATION (Cont)		
	RF Rack	1	607-1885-001
	Power Distribution Panel	1	607-1963-001
Transmitter Group, OT-11(V)2/GRC-169(V)	53E22C-3MW Transmitter Subsystem	2	777-1927-003
	15G1A-MW Klystron Power and Control Unit	1	787-6455-001
	27E8-MW Modulation Amplifier	1	758-5019-003
	23H2-MW AFC Unit	1	758-5410-001
	23K2-2MW AFC Reference Unit	1	777-1489-002
	52E22C-3MW Transmitter Plumbing Assembly	1	777-1929-003
Receiver Group, OR-22(V)3/GRC-169(V)	55E22E-4MW Receiver Subsystem	2	787-6458-023
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	22E2A-4MW IF. Amplifier	1	787-6456-004
	54E22E-4MW Receiver Plumbing Assembly		787-6457-004
Switching Group Electronic, OK-80(V)4/GRC-169(V)	90C2-MW(MOD) Diversity Subsystem	1	607-1971-001
	12D2-MX Power Regulator	2	522-5033-003
	20F2-MW Diversity Combiner	2	758-5015-003
	18E2-MW Control Unit	1	758-5008-001
	78F1-MW Pilot/Noise Sensor	2	522-5623-004
	30A1-( )MW Pilot Converter	2	607-2051-001
	62E3-( )MW Pilot Oscillator	1	607-2048-001
	78G1-MW Alarm Unit	1	522-5705-003
	Patching Jackfield	1	
	Aux Rack	1	607-1885-002
Power Distribution Group, OP-35(V)9/ GRC-169(V)	Power Distribution Group	1	774-4531-012
	19D1-MW Power Distribution Panel	1	758-5536-001
	Converter Regulator Shelf	1	607-1942-001
	16N1-MW Power Converter	2	758-5544-001
	10-kHz LP Filter	1	796-2177-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	EDZELL STATION (Cont)		
Control Monitor Group, OK-81(V)8/GRC-169(V)	Control Monitor Group		774-4518-008
	FA-102 Data Transmitter	1	518-906679-5
	73A1-FA Register and Data Indicator (red lens)	17	522-6654-053
	73A1-FA Register and Data Indicator (green lens)	6	522-6654-063
	68A1-FA Shift Pulse Generator	1	522-6651-016
	68B2-FA Transmitter Control Circuits	1	758-5156-003
	60C1-21FA Tone Oscillator	1	522-6710-024
	76A1-FA Register/Indicator Tester	2	522-6658-023
	78A1-FA Tone-Off Control	3	522-6659-023
	80D1-FA Card Cage	1	522-6661-045
	80D7-FA Card Cage	1	522-5386-024
	Blank Panel	1	762-0608-032
Telephone Terminal Group, OW-32(V)3/ GRC-169(V)	Telephone Terminal Group	1	616-0795-001
	Telephone Cradle Panel	1	607-7038-001
	90A1-MX(MOD) Audio Service Channel	1	607-1946-001
	20B1-MX Termination Unit	1	522-7547-004
	30A1-MX Modulator	1	522-7585-004
	30B1-MX Demodulator	1	522-7586-004
	51B1-MX Audio Amplifier	1	522-7548-004
	62E1-MX Oscillator	1	522-7587-004
	70A3-MX Extender	1	758-5806-001
	Card Cage	1	607-2070-001
	Headset	1	977-0047-000
	Handset	1	126-2434-020
Interconnect Group, ON-57(V)3/GRC-169(V)	Interconnecting Group	1	774-4511-003
	99G2-MW Coupling Subsystem	1	607-1929-001
	12A1-MW Power Regulator	2	522-5874-005
	24C2-MW Baseband Amplifier	4	522-5875-005

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	EDZELL STATION (Cont)		
	26D3-1MX Preemphasis Network	1	522-5811-004
	26E3-1MX Deemphasis Network	1	522-5531-004
	78C2-MW Relay Unit	2	522-5882-004
	Jackfield	1	769-5140-001
Power Distribution Group, OP-35(V)10/ GRC-169(V)	Power Distribution Group		774-4531-013
	Interconnect Group Power Supply	1	796-4440-001
	16K1-MW Power Converter	2	758-5494-001
Interface Group, OU-79(V)2/UC	Technical Control Equipment	1	616-4041-002
	SF Rack	1	607-1885-003
Terminal Block Assembly Assembly, J-3012/UC	Pin Block Assembly	3	764-5198-001
Power Distribution Panel, SB-3578/UC	80G8-MX Power Distribution Panel	1	789-0448-005
Oscillator Distribution Group, OA-8629(V)1/ UC	Signal Oscillator Distribution Group	1	796-3943-001
	Card Cage (Posn 705)	1	607-1872-001
	16N1-MW Power Converter	2	758-5544-001
	60D1-2MX Signaling Oscillator	2	522-6467-003
	Signal Tone Distribution Unit	1	566-6581-004
	Card Cage (Posn 741)	1	607-2158-001
Signal Converter, CU-2856/UC	20J2-MX SF Signaling Unit	12	792-6238-001
	Card Cage (Posn 742—745), wired but not equipped for 12 sf units.	4	607-2158-001
	Card Cage (Posn 760), wired for 24, equipped with 12 attenuator pads.	1	796-2189-001
Variable Attenuator, CN-1372/UC	0—31 dB Pads	12	796-2331-001
	Card Cage (Posn 761), wired, but not equipped for 24 attenuator pads.	1	796-2189-001
	Card Cage Assembly (Posn 762), wired, but not equipped for 12 attenuator pads.	1	796-2189-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	EDZELL STATION (Cont)		
	Circuit Patch Rack	1	607-1885-004
	Circuit Patch Jackfield	3	124-0057-434
	Circuit Patch Jackfield	2	124-0057-435
	Operator Shelf	1	
	VF Patch Rack	1	607-1885-005
	VF Jackfield	3	124-0057-432
	VF Jackfield	2	124-0057-433
	Operator Shelf	1	
Multiplexer Set, AN/UCC-4(V)	Multiplex Carrier Equipment (Government Furnished)	1	
Equalizer Group, OA-8370	Equalizer Equipment mounted in a 7'6" rack (MT-2512)	1	
Multiplexer Group, OB-26(V)	Supergroup and Group Multiplex Equipment mounted in a 7'6" rack (MT-2512)	1	
Multiplexer Group, OB-31(V)	Channel Multiplex Equipment mounted in a 7'6" rack (MT-2512)	1	
Frequency-Power Supply Group, OA-8373(V)	Frequency Generation and Power Supply Equipment mounted in a 7'6" rack (MT-2512)	1	
	Antenna Set	1	616-4022-007
Antenna Radome Set, AS-2650/GR	Antenna-Radome Set	1	616-0799-001
	6-Foot Parabolic Dish, Andrew PL6-71G/S	1	124-0064-245
	6-Foot Tower Mount, Andrew T4B	1	124-0064-236
	6-Foot Heated Radome, Andrew HR6C	1	124-0064-240
Waveguide Assembly, CU-3682/U	Waveguide Assembly	1	616-0800-007
	Elliptical Waveguide, 115 ft, Andrew EWP-71	1	124-0064-228
	2-Port Manifold, Andrew 6600A-2	1	
	Waveguide Dehydrator, Andrew 1924-5	1	

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	EDZELL STATION (Cont)		
	DC Power Plant	1	
	Battery Tray	1	
	Battery, Lead-Calcium, Exide ETC-7	24	
	Battery Charger Rack	1	
	50-Ampere Rectifier/Charger, Power Conversion Products, Inc., 3709C	2	
	Equipment Rack, 19"	1	
	Transistor Counter EMF Cell, Power Conversion Products, Inc.	1	
	Low-Voltage Disconnect Panel, Power Conversion Products, Inc.	1	
	Fuse Panel/Termination Panel/Ground Bar, Power Conversion Products, Inc.	1	
	Inverter, DC to AC, Nova 2560-48	1	
	Inverter Relay Panel	1	
	Deluge Shower	1	
	Transportable Radio and Multiplex Shelter, modified S-280 radio equipment shelter	1	
	CRAIGOWL HILL STATION		
	Microwave Repeater Station	1	607-1835-001
Radio Set AN/GRC-169(V)17	MW-509E Heterodyne Microwave Radio Set (Type IIA)	1	616-0796-008
	RF Rack 1	1	607-1890-001
	Power Distribution Panel	1	607-1963-001
Amplifier Group, OG-56(V)3/GRC-169(V)	50F11-1MW TWT Power Amplifier Subsystem	2	787-6662-003
	15F4A-MW TWT Power Supply	1	787-6310-001
	78P2-MW Power Monitor	1	772-5148-001
	TWT Tray Assembly	1	793-0934-003

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	CRAIGOWL HILL STATION (Cont)		
Converter Group, OU-37(V)2/GRC-169(V)	65F1A-1MW Transmit Converter Subsystem	2	792-6142-010
	16L1A-MW Transmit Power and Control Unit	1	758-5569-004
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	40S2-MW Pad	1	758-5606-002
	Patching Jackfield	1	
	Transmitter Plumbing Assembly	1	793-0889-007
	51F3-MW 70-MHz Amplifier	1	777-1739-002
Receiver Group, OR-22(V)4/GRC-169(V)	55F30A-2MW Receiver Subsystem	2	758-5755-016
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	40M2-MW RF Equalizer	1	758-5509-003
	40M3-MW System Equalizer	1	772-5146-001
	40L2-5MW IF. Filter	1	772-5147-005
	20H1-MW AGC Amplifier	1	758-5504-002
	29A1-MW Limiter	1	758-5506-002
	29B1-MW Discriminator	1	758-5507-002
	62B3-MW 70-MHz Quieting Oscillator	1	772-5284-001
	Receiver Plumbing Assembly	1	793-0850-004
	RF Rack 2	1	607-1890-002
	Same as RF Rack 1		
	Aux Rack	1	607-1890-003
Power Distribution Group, OP-35(V)13/ GRC-169(V)	Power Distribution Group	1	774-4531-016
	19D1-MW DC Power Distribution Panel	1	758-5536-001
	Converter/Regulator Shelf	1	607-1942-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	CRAIGOWL HILL STATION (Cont)		
Control Monitor Group, OK-81(V)9/GRC-169(V)	16N1-MW Power Converter	2	758-5544-001
	24H1-MW Amplifier	1	758-5332-001
	10-kHz LP Filter	1	796-2177-011
	3-kHz LP Filter	1	796-2177-010
	Card Cage (Posn 79)	1	607-1959-001
	40B1-MW Combiner Network	1	522-6640-003
	Control Monitor Group	1	774-4518-009
	FA-102 Data Transmitter	1	518-906679-5
	73A1-FA Register and Data Indicator (red lens)	17	522-6654-053
	73A1-FA Register and Data Indicator (green lens)	6	522-6654-063
	68A1-FA Shift Pulse Generator	1	522-6651-016
	68B2-FA Transmitter Control Circuits	1	758-5156-003
	60C1-19FA Tone Oscillator	1	522-6708-024
	76A1-FA Register/Indicator Tester	2	522-6658-023
	78A1-FA Tone-Off Control	3	522-6659-023
	80D1-FA Card Cage	1	522-6661-045
	80D7-FA Card Cage	1	522-5386-024
	Blank Panel	1	762-0608-032
Telephone Terminal Group, OW-32(V)3/ GRC-169(V)	Telephone Terminal Group		616-0795-001
	Telephone Cradle Panel	1	607-7038-001
	90A1-MX(MOD) Audio Service Channel	1	607-1946-001
	20B1-MX Termination Unit	1	522-7547-004
	30A1-MX Modulator	1	522-7585-004
	30B1-MX Demodulator	1	522-7586-004
	51B1-MX Audio Amplifier	1	522-7548-004
	62E1-MX Oscillator	1	522-7587-004
	70A3-MX Extender	1	758-5806-001
	Card Cage	1	607-2070-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	CRAIGOWL HILL STATION (Cont)		
	Headset	1	977-0047-000
	Handset	1	126-2434-020
	DC Power Plant	1	
	Battery Rack	1	
	Battery, Lead-Calcium, Exide ETC-7	24	
	Battery Charger Rack	1	
	50-Ampere Rectifier/Charger, Power Conversion Products, Inc., 3709C	2	
	Equipment Rack, 19"	1	
	Transistor Counter EMF Cell, Power Conversion Products, Inc.	1	
	Low-Voltage Disconnect Panel, Power Conversion Products, Inc.	1	
	Fuse Panel/Termination Panel/Ground Bar, Power Conversion Products, Inc.	1	
	Deluge Shower	1	
Antenna Set, OE-118(V)6/GR	Antenna Set	1	616-4022-008
Antenna Radome Set, AS-2650/GR	Antenna-Radome Set	2	616-0799-001
	6-Foot Parabolic Dish, Andrew PL6-71G/S	1	124-0064-245
	6-Foot Tower Mount, Andrew T4B	1	124-0064-236
	6-Foot Heated Radome, Andrew HR6C	1	124-0064-240
Waveguide Assembly, CU-3682/U	Waveguide Assembly	2	616-0800-014
	Elliptical Waveguide, 50 ft, Andrew EWP-71	1	124-0064-228
	2-Port Manifold, Andrew 6600A-2	1	
	Waveguide Dehydrator, Andrew 1924-5	1	
	Transportable Radio Shelter, modified S-280 radio equipment shelter	1	
	Emergency-Generator Shelter, standard S-380 engine-generator shelter	1	

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	EAST LOMOND STATION		
	Microwave Repeater Station	1	607-1837-001
Radio Set AN/GRC-169(V)18	MW-509E Heterodyne Microwave Radio Set (Type IIA)	1	616-0796-009
	RF Rack 1	1	607-1895-001
	Power Distribution Panel	1	607-1963-001
Amplifier Group, OG-56(V)3/GRC-169(V)	50F11-2MW TWT Power Amplifier Subsystem	2	787-6662-004
	15F4A-MW TWT Power Supply	1	787-6310-001
	78P2-MW Power Monitor	1	772-5148-001
	TWT Tray Assembly	1	793-0934-004
Converter Group, OU-37(V)2/GRC-169(V)	65F1A-2MW Transmit Converter Subsystem	2	792-6142-014
	16L1A-MW Transmit Power and Control Unit	1	758-5569-004
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	40S2-MW Pad	1	758-5606-002
	Patching Jackfield	1	
	Transmitter Plumbing Assembly	1	793-0889-008
	51F3-MW 70-MHz Amplifier	1	777-1739-002
Receiver Group, OR-22(V)4/GRC-169(V)	55F30A-1MW Receiver Subsystem	2	758-5755-014
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	40M2-MW RF Equalizer	1	758-5509-003
	40M3-MW System Equalizer	1	772-5146-001
	40L2-5MW IF. Filter	1	772-5147-005
	20H1-MW AGC Amplifier	1	758-5504-002
	29A1-MW Limiter	1	758-5506-002
	29B1-MW Discriminator	1	758-5507-002
	62B3-MW 70-MHz Quieting Oscillator	1	772-5284-001
	Receiver Plumbing Assembly	1	793-0850-003

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	EAST LOMOND STATION (Cont)		
	RF Rack 2	1	607-1895-002
	Same as RF Rack 1		
	Aux Rack	1	607-1895-003
Power Distribution Group, OP-35(V)13/ GRC-169(V)	Power Distribution Group	1	774-4531-016
	19D1-MW DC Power Distribution Panel	1	758-5536-001
	Converter/Regulator Shelf	1	607-1942-001
	16N1-MW Power Converter	2	758-5544-001
	24H1-MW Amplifier	1	758-5332-001
	10-kHz LP Filter	1	796-2177-011
	3-kHz LP Filter	1	796-2177-010
	Card Cage	1	607-1959-001
	40B1-MW Combiner Network	1	522-6640-003
Control Monitor Group, OK-81(V)10/ GRC-169(V)	Control Monitor Group	1	774-4518-010
	FA-102 Data Transmitter	1	518-906679-5
	73A1-FA Register and Data Indicator (red lens)	1	522-6654-053
	73A1-FA Register and Data Indicator (green lens)	1	522-6654-063
	68A1-FA Shift Pulse Generator	1	522-6651-016
	68B2-FA Transmitter Control Circuits	1	758-5156-003
	60C1-20FA Tone Oscillator	1	522-6709-024
	76A1-FA Register/Indicator Tester	1	522-6658-023
	78A1-FA Tone-Off Control	1	522-6659-023
	80D1-FA Card Cage	1	522-6661-045
	80D7-FA Card Cage	1	522-5386-024
	Blank Panel	1	762-0608-032
Telephone Terminal Group, OW-32(V)3/ GRC-169(V)	Telephone Terminal Group	1	616-0795-001
	Telephone Cradle Panel	1	607-7038-001
	90A1-MX(MOD) Audio Service Channel	1	607-1946-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	EAST LOMOND STATION (Cont)		
	20B1-MX Termination Unit	1	522-7547-004
	30A1-MX Modulator	1	522-7585-004
	30B1-MX Demodulator	1	522-7586-004
	51B1-MX Audio Amplifier	1	522-7584-004
	62E1-MX Oscillator	1	522-7587-004
	70A3-MX Extender	1	758-5806-001
	Card Cage	1	607-2070-001
	Headset	1	977-0047-000
	Handset	1	126-2434-020
	DC Power Plant	1	
	Battery Rack	1	
	Battery, Lead Calcium, Exide ETC-7	24	
	Battery Charger Rack	1	
	50-Ampere Rectifier/Charger, Power Conversion Products, Inc., 3709C	2	
	Equipment Rack, 19"	1	
	Transistor Counter EMF Cell, Power Conversion Products, Inc.	1	
	Low-Voltage Disconnect Panel, Power Conversion Products, Inc.	1	
	Fuse Panel/Termination Panel/Ground Bar, Power Conversion Products, Inc.	1	
	Deluge Shower	1	
Antenna Set OE-118(V)7/GR	Antenna Set	1	616-4022-009
Antenna Radome Set, AS-2650/GR	Antenna-Radome Set	2	616-0799-001
	6-Foot Parabolic Dish, Andrew PL6-71G/S	1	124-0064-245
	6-Foot Tower Mount, Andrew T4B	1	124-0064-236
	6-Foot Heated Radome, Andrew HR6C	1	124-0064-240
Waveguide Assembly, CU-3682/U	Waveguide Assembly	1	616-0800-010
	Elliptical Waveguide, 80 ft, Andrew EWP-71	1	124-0064-228

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	EAST LOMOND STATION (Cont)		
Waveguide Assembly, CU-3682/U	Waveguide Assembly	1	616-0800-015
	Elliptical Waveguide, 100 ft, Andrew EWP-71	1	124-0064-228
	2-Port Manifold, Andrew 6600A-2	1	
	Waveguide Dehydrator, Andrew 1924-5	1	
	Transportable Radio Shelter, modified S-280 radio equipment shelter	1	
	Emergency-Generator Shelter, standard S-380 engine-generator shelter	1	
	KIRK O'SHOTTS STATION		
	Microwave Repeater Station	1	607-1839-001
Radio Set AN/GRC-169(V)19	MW-509E Heterodyne Microwave Radio Set (Type IIA)	1	616-0796-010
	RF Rack 1	1	607-1900-001
	Power Distribution Panel	1	607-1963-001
Amplifier Group, OG-56(V)3/GRC-169(V)	50F11-1MW TWT Power Amplifier	2	787-6662-003
	15F4A-MW TWT Power Supply	1	787-6310-001
	78P2-MW Power Monitor	1	772-5148-001
	TWT Tray Assembly	1	793-0934-003
Converter Group, OU-37(V)2/GRC-169(V)	65F1A-1MW Transmit Converter Subsystem	2	792-6142-010
	16L1A-MW Transmit Power and Control Unit	1	758-5569-004
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	40S2-MW Pad	1	758-5606-002
	Patching Jackfield	1	
	Transmitter Plumbing Assembly	1	793-0889-007
	51F3-MW 70-MHz Amplifier	1	777-1739-002

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	KIRK O'SHOTTS STATION (Cont)		
Receiver Group, OR-22(V)4/GRC-169(V)	55F30A-2MW Receiver Subsystem	2	758-5755-016
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	40M2-MW RF Equalizer	1	758-5509-003
	40M3-MW System Equalizer	1	772-5146-001
	40L2-5MW IF. Filter	1	772-5147-005
	20H1-MW AGC Amplifier	1	758-5504-002
	29A1-MW Limiter	1	758-5506-002
	29B1-MW Discriminator	1	758-5507-002
	62B3-MW 70-MHz Quieting Oscillator	1	772-5284-001
	Receiver Plumbing Assembly	1	793-0850-004
	RF Rack 2	1	607-1900-002
	Same as RF Rack 1		
	Aux Rack	1	607-1900-003
Power Distribution Group, OP-35(V)13/ GRC-169(V)	Power Distribution Group	1	774-4531-016
	19D1-MW DC Power Distribution Panel	1	758-5536-001
	Converter/Regulator Shelf	1	607-1942-001
	16N1-MW Power Converter	2	758-5544-001
	24H1-MW Amplifier	1	758-5332-001
	10-kHz LP Filter	1	796-2177-011
	3-kHz LP Filter	1	796-2177-010
	Card Cage	1	607-1959-001
	40B1-MW Combiner Network	1	522-6640-003
Control Monitor Group, OK-81(V)11/GRC-169 (V)	Control Monitor Group	1	774-4518-011
	FA-102 Data Transmitter	1	518-906679-5
	73A1-FA Register and Data Indicator (red lens)	17	522-6654-053

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	KIRK O'SHOTTS STATION (Cont)		
Telephone Terminal Group, OW-32(V)3/ GRC-169(V)	73A1-FA Register and Data Indicator (green lens)	6	522-6654-063
	68A1-FA Shift Pulse Generator	1	522-6651-016
	68B2-MW Transmitter Control Circuits	1	758-5156-003
	60C1-22FA Tone Oscillator	1	522-6711-024
	76A1-FA Register/Indicator Tester	2	522-6658-023
	78A1-FA Tone-Off Control	3	522-6659-023
	80D1-FA Card Cage	1	522-6661-045
	80D7-FA Card Cage	1	522-5386-024
	Blank Panel	1	762-0608-032
	Telephone Terminal Group	1	616-0795-001
	Telephone Cradle Panel	1	607-7038-001
	90A1-MX(MOD) Audio Service Channel	1	607-1946-001
	20B1-MX Termination Unit	1	522-7547-004
	30A1-MX Modulator	1	522-7585-004
	30B1-MX Demodulator	1	522-7586-004
	51B1-MX Audio Amplifier	1	522-7548-004
	62E1-MX Oscillator	1	522-7587-004
	70A3-MX Extender	1	758-5806-001
	Card Cage	1	607-2070-001
	Headset	1	977-0047-000
	Handset	1	126-2434-020
	DC Power Plant	1	
	Battery Rack	1	
	Battery, Lead-Calcium, Exide ETC-7	24	
	Battery Charger Rack	1	
	50-Ampere Rectifier/Charger, Power Conversion Products, Inc., 3709C	2	

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	KIRK O'SHOTTS STATION (Cont)		
	Equipment Rack, 19"	1	
	Transistor Counter EMF Cell, Power Conversion Products, Inc.	1	
	Low-Voltage Disconnect Panel, Power Conversion Products, Inc.	1	
	Fuse Panel/Termination Panel and Ground Bar, Power Conversion Products, Inc.	1	
	Deluge Shower	1	
Antenna Set, OE-118(V)8/GR	Antenna Set	1	616-4022-010
Antenna Radome Set, AS-2650/GR	Antenna-Radome Set	2	616-0799-001
	6-Foot Parabolic Dish, Andrew PL6-71G/S	1	124-0064-245
	6-Foot Tower Mount, Andrew T4B	1	124-0064-236
	6-Foot Heated Radome, Andrew HR6C	1	124-0064-240
Waveguide Assembly, CU-3682/U	Waveguide Assembly	1	616-0800-016
	Elliptical Waveguide, 140 ft, Andrew EWP-71	1	124-0064-228
Waveguide Assembly, CU-3682/U	Waveguide Assembly	1	616-0800-001
	Elliptical Waveguide, 150 ft, Andrew EWP-71	1	124-0064-228
	2-Port Manifold, Andrew 6600A-2	1	
	Waveguide Dehydrator, Andrew 1924-5	1	
	Transportable Radio Shelter, modified S-280 radio equipment shelter	1	
	Emergency-Generator Shelter, standard S-280 engine-generator shelter	1	
	SERGEANT LAW STATION		
	Microwave Repeater Station		607-1841-001
Radio Set, AN/GRC-169(V)20	MW-509E Heterodyne Microwave Radio Set (Type IIA)	1	616-0796-011

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	SERGEANT LAW STATION (Cont)		
	RF Rack 1	1	607-1905-001
	Power Distribution Panel	1	607-1963-001
Amplifier Group, OG-56(V)3/GRC-169(V)	50F11-2MW TWT Power Amplifier Subsystem	2	787-6662-004
	15F4A-MW TWT Power Supply	1	787-6310-001
	78P2-MW Power Monitor	1	772-5148-001
	TWT Tray Assembly	1	793-0934-004
Converter Group, OU-37(V)2/GRC-169(V)	65F1A-2MW Transmit Converter Subsystem	2	792-6142-014
	16L1A-MW Transmit Power and Control Unit	1	758-5569-004
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	40S2-MW Pad	1	758-5606-002
	Patching Jackfield	1	
	Transmitter Plumbing Assembly	1	793-0889-008
	51F3-MW 70-MHz Amplifier	1	777-1739-002
Receiver Group, OR-22(V)4/GRC-169(V)	55F30A-1MW Receiver Subsystem	2	758-5755-014
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	40M2-MW RF Equalizer	1	758-5509-003
	40M3-MW System Equalizer	1	772-5146-001
	40L2-5MW IF. Filter	1	772-5147-005
	20H1-MW AGC Amplifier	1	758-5504-002
	29A1-MW Limiter	1	758-5506-002
	29B1-MW Discriminator	1	758-5507-002
	62B3-MW 70-MHz Quieting Oscillator	1	772-5284-001
	Receiver Plumbing Assembly	1	793-0850-003
	RF Rack 2	1	607-1905-002
	Same as RF Rack 1		

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	SERGEANT LAW STATION (Cont)		
	Aux Rack	1	607-1905-003
Power Distribution Group, OP-35(V)13/ GRC-169(V)	Power Distribution Group		774-4531-016
	19D1-MW DC Power Distribution Panel	1	758-5536-001
	Converter/Regulator Shelf	1	607-1942-001
	16N1-MW Power Converter	2	758-5544-001
	24H1-MW Amplifier	1	758-5332-001
	10-kHz LP Filter	1	796-2177-011
	3-kHz LP Filter	1	796-2177-010
	Card Cage Assembly	1	607-1959-001
	40B1-MW Combiner Network	1	522-6640-003
Control Monitor Group, OK-81(V)12/ GRC-169(V)	Control Monitor Group		774-4518-012
	FA-102 Data Transmitter	1	518-906679-5
	73A1-FA Register and Data Indicator (red lens)	17	522-6654-053
	73A1-FA Register and Data Indicator (green lens)	16	522-6654-063
	68A1-FA Shift Pulse Generator	1	522-6651-016
	68B2-FA Transmitter Control Circuits	1	758-5156-003
	60C1-24FA Tone Oscillator	1	522-6713-024
	76A1-FA Register/Indicator Tester	1	522-6658-023
	78A1-FA Tone-Off Control	1	522-6659-023
	80D1-FA Card Cage		522-6661-045
	80D7-FA Card Cage		522-5386-024
	Blank Panel	1	762-0608-032
Telephone Terminal Group, OW-32(V)3/ GRC-169(V)	Telephone Terminal Group	1	616-0795-001
	Telephone Cradle Panel	1	607-7038-001
	90A1-MX(MOD) Audio Service Channel	1	607-1946-001
	20B1-MX Termination Unit	1	522-7547-004
	30A1-MX Modulator	1	522-7585-004

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	SERGEANT LAW STATION (Cont)		
	30B1-MX Demodulator	1	522-7586-004
	51B1-MX Audio Amplifier	1	522-7584-004
	62E1-MX Oscillator	1	522-7587-004
	70A3-MX Extender	1	758-5806-001
	Card Cage	1	602-2070-001
	Headset	1	977-0047-000
	Handset	1	126-2434-020
	DC Power Plant	1	
	Battery Tray	1	
	Battery, Lead-Calcium, Exide ETC-7	24	
	Battery Charger Rack	1	
	50-Ampere Rectifier/Charger, Power Conversion Products, Inc., 3709C	2	
	Equipment Rack, 19"	1	
	Transistor Counter EMF Cell, Power Conversion Products, Inc.	1	
	Low-Voltage Disconnect Panel, Power Conversion Products, Inc.	1	
	Fuse Panel/Termination Panel/Ground Bar, Power Conversion Products, Inc.	1	
	Deluge Shower	1	
Antenna Set OE-118(V)9/GR	Antenna Set	1	616-4022-011
Antenna Radome Set, AS-2650/GR	Antenna-Radome Set	2	616-0799-001
	6-Foot Parabolic Dish, Andrew PL6-71G/S	1	124-0064-245
	6-Foot Tower Mount, Andrew T4B	1	124-0064-236
	6-Foot Heated Radome, Andrew HR6C	1	124-0064-240
Waveguide Assembly, CU-3682/U	Waveguide Assembly	1	616-0800-017
	Elliptical Waveguide, 90 ft, Andrew EWP-71	1	124-0064-228

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	SERGEANT LAW STATION (Cont)		
Waveguide Assembly, CU-3682/U	Waveguide Assembly	1	616-0800-018
	Elliptical Waveguide, 185 ft, Andrew EWP-71	1	124-0064-228
	2-Port Manifold, Andrew 6600A-2	1	
	Waveguide Dehydrator, Andrew 1924-5	1	
	Transportable Radio Shelter, modified S-280 radio equipment shelter	1	
	Emergency-Generator Shelter, standard S-280 engine-generator shelter	1	
	BROWN CARRICK STATION		
	Microwave Repeater Station	1	607-1843-001
Radio Set, AN/GRC-169(V)21	MW-509E Heterodyne Microwave Radio Set (Type IIA/IIC)	1	616-0796-012
	RF Rack 1	1	607-1910-001
	Power Distribution Panel	1	607-1963-001
Amplifier Group, OG-56(V)3/GRC-169(V)	50F11-1MW TWT Power Amplifier Subsystem	2	787-6662-003
	15F4A-MW TWT Power Supply	1	787-6310-001
	78P2-MW Power Monitor	1	772-5148-001
	TWT Tray Assembly	1	793-0934-003
Converter Group, OU-37(V)2/GRC-169(V)	65F1A-1MW Transmit Converter Subsystem	2	792-6142-010
	16L1A-MW Transmitter Power and Control Unit	1	758-5569-004
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	40S2-MW Pad	1	758-5606-002
	Patching Jackfield	1	
	Transmitter Plumbing Assembly	1	793-0889-007
	51F3-MW 70-MHz Amplifier	1	777-1739-002

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	BROWN CARRICK STATION (Cont)		
Receiver Group, OR-22(V)4/GRC-169(V)	55F30A-2MW Receiver Subsystem	2	758-5755-016
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	40M2-MW RF Equalizer	1	758-5509-003
	40M3-MW System Equalizer	1	772-5146-001
	40L2-5MW IF. Filter	1	772-5147-005
	20H1-MW AGC Amplifier	1	758-5504-002
	29A1-MW Limiter	1	759-5506-002
	29B1-MW Discriminator	1	758-5507-002
	62B3-MW 70-MHz Quieting Oscillator	1	772-5284-001
	Receiver Plumbing Assembly	1	793-0850-004
	RF Rack 2	1	607-1919-002
	Power Distribution Panel	1	607-1963-001
Amplifier Group, OG-56(V)3/GRC-169(V)	50F11-1MW TWT Power Amplifier Subsystem	1	787-6662-003
	15F4A-MW TWT Power Supply	1	787-6310-001
	78P2-MW Power Monitor	1	772-5148-001
	TWT Tray Assembly	1	793-0934-004
Converter Group, OU-37(V)2/GRC-169(V)	65F1A-1MW Transmit Converter Subsystem	1	792-6142-010
	16L1A-MW Transmit Power and Control Unit	1	758-5569-004
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	40S2-MW Pad	1	758-5606-002
	Patching Jackfield	1	
	Transmitter Plumbing Assembly	1	793-0889-007
	51F3-MW 70-MHz Amplifier	1	777-1739-002

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	BROWN CARRICK STATION (Cont)		
Receiver Group, OR-22(V)4/GRC-169(V)	55F30A-2MW Receiver Subsystem	2	758-5755-016
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	40M2-MW RF Equalizer	1	758-5509-003
	40M3-MW System Equalizer	1	772-5146-001
	40L2-5MW IF. Filter	1	772-5147-005
	20H1-MW AGC Amplifier	1	758-5504-002
	29A1-MW Limiter	1	758-5506-002
	29B1-MW Discriminator	1	758-5507-002
	62B3-MW 70-MHz Quieting Oscillator	1	772-5284-001
	Receiver Plumbing Assembly	1	793-0850-004
Switching Group Electronic, OK-80(V)5/ GRC-169(V)	90E2-MW(MOD) IF. Switch Subsystem	1	607-1973-001
	16N1-MW Power Converter	2	758-5544-001
	78J1-MW Comparator	1	758-5067-003
	2F1-MW Diode Switch	1	758-5070-003
	18E3-MW Control Unit	1	758-5593-001
	78F1-MW Pilot/Noise Sensor	2	522-5623-004
	30A1-( )MW Pilot Converter	2	607-2051-001
	Patching Jackfield	1	
	RF Rack 3	1	607-1910-003
	Same as RF Rack 2		
	Aux Rack	1	607-1910-004
Power Distribution Group, OP-35(V)13/ GRC-169(V)	Power Distribution Group		774-4531-016
	19D1-MW Power Distribution Panel	1	758-5536-001
	Converter/Regulator Shelf	1	607-1942-001
	16N1-MW Power Converter	2	758-5544-001
	24H1-MW Amplifier	1	758-5332-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	BROWN CARRICK STATION (Cont)		
	10-kHz LP Filter	1	796-2177-011
	3-kHz LP Filter	1	796-2177-010
	Card Cage	1	607-1959-001
	40B1-MW Combiner Network	1	522-6640-003
Control Monitor Group, OK-81(V)13/ GRC-169(V)	Control Monitor Group	1	774-4518-013
	FA-102 Data Transmitter	1	518-906679-5
	73A1-FA Register and Data Indicator (red lens)	17	522-6654-053
	73A1-FA Register and Data Indicator (green lens)	6	522-6654-063
	68A1-FA Shift Pulse Generator	1	522-6651-016
	60C1-26FA Tone Oscillator	1	522-6715-024
	76A1-FA Register/Indicator Tester	2	522-6658-023
	78A1-FA Tone-Off Control	3	522-6659-023
	80D1-FA Card Cage	1	522-6661-045
	80D7-FA Card Cage	1	522-5386-024
	Blank Panel	1	762-0608-032
Telephone Terminal Group, OW-32(V)3/ GRC-169(V)	Telephone Terminal Group		616-0795-001
	Telephone Cradle Panel	1	607-7038-001
	90A1-MX(MOD) Audio Service Channel	1	607-1946-001
	20B1-MX Termination Unit	1	522-7547-004
	30A1-MX Modulator	1	522-7585-004
	30B1-MX Demodulator	1	522-7586-004
	51B1-MX Audio Amplifier	1	522-7548-004
	62E1-MX Oscillator	1	522-7587-004
	70A3-MX Extender	1	758-5806-001
	Card Cage	1	607-2070-001
	Headset	1	977-0047-000
	Handset	1	126-2434-020

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	BROWN CARRICK STATION (Cont)		
	DC Power Plant	1	
	Battery Tray	1	
	Battery, Lead-Calcium, Exide ETC-9	24	
	Battery Charger Rack	1	
	50-Ampere Rectifier/Charger, Power Conversion Products, Inc., 3709C	2	
	Equipment Rack, 19"	1	
	Transistor Counter EMF Cell, Power Conversion Products, Inc.	1	
	Low-Voltage Disconnect Panel, Power Conversion Products, Inc.	1	
	Fuse Panel/Termination Panel/Ground Bar, Power Conversion Products, Inc.	1	
	Deluge Shower	1	
Antenna Set, OE-118(V)10/GR	Antenna Set	1	616-4022-012
Antenna Radome Set, AS-2650/GR	Antenna-Radome Set	1	616-0799-001
	6-Foot Parabolic Dish, Andrew PL6-71G/S	1	124-0064-245
	6-Foot Tower Mount, Andrew T4B	1	124-0064-236
	6-Foot Heated Radome, Andrew HR6C	1	124-0064-240
Antenna Radome Set, AS-2654/GR	Antenna-Radome Set	2	616-0799-005
	12-Foot Parabolic Dish, Andrew PXL12-71G/S	1	124-0064-243
	12-Foot Tower Mount, Andrew T12B	1	124-0064-235
	12-Foot Heated Radome, Andrew HR12D	1	124-0064-238
Waveguide Assembly, CU-3682/U	Waveguide Assembly	1	616-0800-019
	Elliptical Waveguide, 175 ft, Andrew EWP-71	1	124-0064-228
Waveguide Assembly, CU-3682/U	Waveguide Assembly	1	616-0800-020
	Elliptical Waveguide, 200 ft, Andrew EWP-71	1	124-0064-228

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	BROWN CARRICK STATION (Cont)		
Waveguide Assembly CU-3682/U	Waveguide Assembly	1	616-0800-021
	Elliptical Waveguide, 170 ft, Andrew EWP-71	1	124-0064-228
	4-Port Manifold, Andrew 6600A-4	1	
	Waveguide Dehydrator, Andrew 1924-5	1	
	Transportable Radio Shelter, modified S-280 radio equipment shelter	1	
	Emergency-Generator Shelter, standard S-280 engine-generator shelter	1	
	SLIEVEANORRA STATION		
	Microwave Repeater Station	1	607-1845-001
Radio Set, AN/GRC-169(V)22	MW-509E Heterodyne Microwave Radio Set (Type IIA/IIC)	1	616-0796-013
	RF Rack 1	1	607-1915-001
	Power Distribution Panel	1	607-1963-001
Amplifier Group, OG-56(V)3/GRC-169(V)	50F11-2MW TWT Power Amplifier Subsystem	2	787-6662-004
	15F4A-MW TWT Power Supply	1	787-6310-001
	78P2-MW Power Monitor	1	772-5148-001
	TWT Tray Assembly	1	793-0934-004
Converter Group, OU-37(V)2/GRC-169(V)	65F1A-2MW Transmit Converter Subsystem	2	792-6142-014
	16L1A-MW Transmit Power and Control Unit	1	758-5569-004
	78Q1-MW Off-Frequency Alarm Unit		772-5173-001
	40S2-MW Pad	1	758-5606-002
	Patching Jackfield	1	
	Transmitter Plumbing Assembly	1	793-0889-008
	51F3-MW 70-MHz Amplifier	1	777-1739-002

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	SLIEVEANORRA STATION (Cont)		
Receiver Group, OR-22(V)4/GRC-169(V)	55F30A-1MW Receiver Subsystem	2	758-5755-014
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	78Q1-MW Off-Frequency Alarm Unit		772-5173-001
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	40M2-MW RF Equalizer	1	758-5509-003
	40M3-MW System Equalizer	1	772-5146-001
	40L2-5MW IF. Filter	1	772-5147-005
	20H1-MW AGC Amplifier	1	758-5504-002
	29A1-MW Limiter	1	758-5506-002
	29B1-MW Discriminator	1	758-5507-002
	62B3-MW 70-MHz Quieting Oscillator	1	772-5284-001
	Receiver Plumbing Assembly	1	793-0850-003
	RF Rack 2	1	607-1915-002
	Power Distribution Panel	1	607-1963-001
Amplifier Group, OG-56(V)3/GRC-169(V)	50F11-2MW TWT Power Amplifier Subsystem	1	787-6662-004
	15F4A-MW TWT Power Supply	1	787-6310-001
	78P2-MW Power Monitor	1	772-5148-001
	TWT Tray Assembly	1	793-0934-004
Converter Group, OU-37(V)2/GRC-169(V)	65F1A-2MW Transmit Converter Subsystem	1	792-6142-014
	16L1A-MW Transmitter Power and Control Unit	1	758-5569-004
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	40S2-MW Pad	1	758-5606-002
	Patching Jackfield	1	
	Transmitter Plumbing Assembly	1	793-0889-008
	51F3-MW 70-MHz Amplifier	1	777-1793-002

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	SLIEVEANORRA STATION (Cont)		
Receiver Group, OR-22(V)4/GRC-169(V)	55F30A-1MW Receiver Subsystem	2	758-5755-014
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	40M2-MW RF Equalizer	1	758-5509-003
	40M3-MW System Equalizer	1	772-5146-001
	40L2-5MW IF. Filter	1	772-5147-005
	20H1-MW AGC Amplifier	1	758-5504-002
	29A1-MW Limiter	1	758-5506-002
	29B1-MW Discriminator	1	758-5507-002
	62B3-MW 70-MHz Quieting Oscillator	1	772-5284-001
	Receiver Plumbing Assembly	1	793-0850-003
Switching Group Electronic, OK-80(V)5/ GRC-169(V)	90E2-MW(MOD) IF. Switch Subsystem	1	607-1973-001
	16N1-MW Power Converter	2	758-5544-001
	78J1-MW Comparator	1	758-5067-003
	2F1-MW Diode Switch	1	758-5070-003
	18E3-MW Control Unit	1	758-5593-001
	78F1-MW Pilot/Noise Sensor	2	522-5623-004
	30A1-( )MW Pilot Converter	2	607-2051-001
	Patching Jackfield	1	
	RF Rack 3	1	607-1915-003
	Same as RF Rack 2		
	Aux Rack	1	607-1915-004
Power Distribution Group, OP-35(V)13/ GRC-169(V)	Power Distribution Group	1	774-4531-016
	19D1-MW DC Power Distribution Panel	1	758-5536-001
	Converter/Regulator Shelf	1	607-1942-001
	16N1-MW Power Converter	2	758-5544-001
	24H1-MW Amplifier	1	758-5332-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	SLIEVEANORRA STATION (Cont)		
	10-kHz LP Filter	1	796-2177-011
	3-kHz LP Filter	1	796-2177-010
	Card Cage	1	607-1959-001
	40B1-MW Combiner Network	1	522-6640-003
Control Monitor Group, OK-81(V)14/ GRC-169(V)	Control Monitor Group	1	774-4518-014
	FA-102 Data Transmitter	1	518-906679-5
	73A1-FA Register and Data Indicator (red lens)	17	522-6654-053
	73A1-FA Register and Data Indicator (green lens)	6	522-6654-063
	68A1-FA Shift Pulse Generator	1	522-6651-016
	60C1-28FA Tone Oscillator	1	522-6717-024
	76A1-FA Register/Indicator Tester	2	522-6658-023
	78A1-FA Tone-Off Control	3	522-6659-023
	80D1-FA Card Cage	1	522-6661-045
	80D7-FA Card Cage	1	522-5386-024
	Blank Panel	1	762-0608-032
Telephone Terminal Group, OW-32(V)3/ GRC-169(V)	Telephone Terminal Group		616-0795-001
	Telephone Cradle Panel	1	607-7038-001
	90A1-MX(MOD) Audio Service Channel	1	607-1946-001
	20B1-MX Termination Unit	1	522-7547-004
	30A1-MX Modulator	1	522-7585-004
	30B1-MX Demodulator	1	522-7586-004
	51B1-MX Audio Amplifier	1	522-7548-004
	62E1-MX Oscillator	1	522-7587-004
	70A3-MX Extender		758-5806-001
	Card Cage	1	607-2070-001
	Headset	1	977-0047-000
	Handset	1	126-2434-020

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	SLIEVEANORRA STATION (Cont)		
	DC Power Plant	1	
	Battery Rack	1	
	Battery, Lead-Calcium, Exide ETC-9	24	
	Battery Charger Rack	1	
	50-Ampere Rectifier/Charger, Power Conversion Products, Inc., 3709C	2	
	Equipment Rack, 19"	1	
	Transistor Counter EMF Cell, Power Conversion Products, Inc.	1	
	Low-Voltage Disconnect Panel, Power Conversion Products, Inc.	1	
	Fuse Panel/Termination Panel/Ground Bar, Power Conversion Products, Inc.	1	
	Deluge Shower	1	
Antenna Set, OE-118(V)11/GR	Antenna Set	1	616-4022-013
Antenna Radome Set, AS-2650/GR	Antenna-Radome Set	1	616-0799-001
	6-Foot Parabolic Dish, Andrew PL6-71G/S	1	124-0064-245
	6-Foot Tower Mount, Andrew T4B	1	124-0064-236
	6-Foot Heated Radome, Andrew HR6C	1	124-0064-240
Antenna Radome Set, AS-2654/GR	Antenna-Radome Set	2	616-0799-005
	12-Foot Parabolic Dish, Andrew PXL12-71G/S	1	124-0064-243
	12-Foot Tower Mount, Andrew T12B	1	124-0064-235
	12-Foot Heated Radome, Andrew HR12D	1	124-0064-238
Waveguide Assembly, CU-3682/U	Waveguide Assembly	2	616-0800-022
	Elliptical Waveguide, 110 ft, Andrew EWP-71	1	124-0064-228
Waveguide Assembly CU-3682/U	Waveguide Assembly	1	616-0800-023
	Elliptical Waveguide, 95 ft, Andrew EWP-71	1	124-0064-228

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	SLIEVEANORRA STATION (Cont)		
Waveguide Assembly, CU-3682/U	Waveguide Assembly	1	616-0800-024
	Elliptical Waveguide, 65 ft, Andrew EWP-71	1	124-0064-228
	DUNGIVEN STATION		
	Microwave Terminal Station	1	607-1847-001
Radio Set, AN/GRC-169(V)23	MW-509E Heterodyne Microwave Radio Set (Type IA)	1	616-0796-014
	RF Rack	1	607-1920-001
	Power Distribution Panel	1	607-1963-001
Amplifier Group, OG-56(V)3/GRC-169(V)	50F11-1MW TWT Power Amplifier Subsystem	2	787-6662-003
	15F4A-MW TWT Power Supply	1	787-6310-001
	78P2-MW Power Monitor	1	772-5148-001
	TWT Tray Assembly	1	793-0934-003
Converter Group, OU-37(V)2/GRC-169(V)	65F1A-1MW Transmit Converter Subsystem	2	792-6142-010
	16L1A-MW Transmit Power and Control Unit	1	758-5569-004
	78Q1-MW Off-Frequency Alarm	1	772-5173-001
	40S2-MW Pad	1	758-5606-002
	Patching Jackfield	1	
	Transmitter Plumbing Assembly	1	793-0889-007
	51F3-MW 70-MHz Amplifier	1	777-1739-002
Receiver Group, OR-22(V)4/GRC-169(V)	55F30A-2MW Receiver Subsystem	2	758-5755-016
	16M1B-MW Receiver Power and Control Unit	1	787-6661-002
	78Q1-MW Off-Frequency Alarm Unit	1	772-5173-001
	51G1-MW 70-MHz Mixer/Amplifier	1	787-6459-001
	40M2-MW RF Equalizer	1	758-5509-003

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	DUNGIVEN STATION (Cont)		
	40M3-MW System Equalizer	1	772-5146-001
	40L2-5MW IF. Filter	1	772-5147-005
	20H1-MW AGC Amplifier	1	758-5504-002
	29A1-MW Limiter	1	758-5506-002
	29B1-MW Discriminator	1	758-5507-002
	62B3-MW 70-MHz Quieting Oscillator	1	772-5284-001
	Receiver Plumbing Assembly	1	793-0850-004
	Aux Rack	1	607-1920-002
Power Distribution Group, OP-35(V)9/GRC-169(V)	Power Distribution Group	1	774-4531-012
	19D1-MW Power Distribution Panel	1	758-5536-001
	Converter/Regulator Shelf	1	607-1942-001
	16N1-MW Power Converter	2	758-5544-001
	10-kHz LP Filter	1	796-2177-011
Control Monitor Group, OK-81(V)15/GRC-169(V)	Control Monitor Group	1	774-4518-015
	FA-102 Data Transmitter	1	518-906679-5
	73A1-FA Register and Data Indicator (red lens)	17	522-6654-053
	73A1-FA Register and Data Indicator (green lens)	6	522-6654-063
	68A1-FA Shift Pulse Generator	1	522-6651-016
	68B2-FA Transmitter Control Circuits	1	758-5156-003
	60C1-35FA Tone Oscillator	1	777-1633-005
	76A1-FA Register/Indicator Tester	2	522-6658-023
	78A1-FA Tone-Off Control	3	522-6659-023
	80D1-FA Card Cage	1	522-6661-045
	80D7-FA Card Cage	1	522-5386-024
Dual Transmitter Group, OZ-3(V)2/GRC-169(V)	35A1-MW FM Transmitter Subsystem	2	758-5537-010
	16N1-MW Power Regulator	1	758-5564-001
	23H3-MW AFC Unit	1	758-5502-001
	62G1-MW FM Generator	1	758-5212-001
	Patching Jackfield	1	

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	DUNGIVEN STATION (Cont)		
Switching Group Electronic, OK-80(V)4/ GRC-169(V)	90C2-MW(MOD) Diversity Subsystem	1	607-1971-001
	12D2-MX Power Regulator	1	522-5033-003
	20F2-MW Diversity Combiner	2	758-5015-007
	18E2-MW Control Unit	1	758-5008-001
	78F1-MW Pilot/Noise Sensor	2	522-5623-004
	30A1-( )MW Pilot Converter	2	607-2051-001
	62E3-( )MW Pilot Oscillator	1	607-2048-001
	78G1-MW Alarm Unit	1	522-5705-003
	Jackfield	1	
Telephone Terminal Group, OW-32(V)3/ GRC-169(V)	Telephone Terminal Group	1	616-0795-001
	Telephone Cradle Panel	1	607-7038-001
	90A1-MW(MOD) Audio Service Channel	1	607-1946-001
	20B1-MX Termination Unit	1	522-7547-004
	30A1-MX Modulator	1	522-7585-004
	30B1-MX Demodulator	1	522-7586-004
	51B1-MX Audio Amplifier	1	522-7548-005
	62E1-MX Oscillator	1	522-7587-004
	70A3-MX Extender		758-5806-001
	Card Cage	1	607-2070-001
	Headset	1	977-0047-000
	Handset	1	126-2434-020
Interconnect Group, ON-57(V)3/GRC-169(V)	99G2-MW Coupling Subsystem	1	774-4511-003
	12A1-MW Power Regulator	2	522-5874-005
	24C2-MW Baseband Amplifier	4	522-5875-005
	26D3-1MX Preemphasis Network	1	522-5811-004
	26E3-1MX Deemphasis Network	1	522-5531-004
	78C2-MW Relay Unit	2	522-5882-004
	Jackfield	1	769-5140-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	DUNGIVEN STATION (Cont)		
Power Distribution Group, OP-35(V)10/ GRC-169(V)	Power Distribution Group	1	774-4531-013
	Interconnect Group Power Supply	1	796-4440-001
	16K1-MW Power Converter	2	758-5494-001
	4-Way/4-Wire Bridge	1	126-2329-110
	Aux Rack	1	607-1920-005
	19D1-MW Power Distribution Panel	1	758-5536-001
	Inverter, DC to AC, Nova 2560-48	1	
	Inverter Relay Panel	1	
Interconnect Group, ON-57(V)8/GRC-169(V)	Interconnecting Group	1	774-4511-008
	99G2-MW Coupling Subsystem	1	607-1929-001
	12A1-MW Power Regulator	2	522-5874-005
	24C2-MW Baseband Amplifier	4	522-5875-005
	26D3-1MX Preemphasis Network	1	522-5811-004
	26E3-1MX Deemphasis Network	1	522-5531-004
	78C2-MW Relay Unit	2	522-5882-004
	Jackfield	1	769-5140-001
Power Distribution Group, OP-35(V)12/ GRC-169(V)	Power Distribution Group	1	774-4531-015
	Interconnect Group Power Supply	1	796-4440-001
	16K1-MW Power Converter	4	758-5494-001
Interconnect Group, ON-57(V)9/GRC-169(V)	Interconnecting Group	1	774-4511-009
	99G2-MW Coupling Subsystem	1	607-1929-001
	12A1-MW Power Regulator	2	522-5874-005
	24C2-MW Baseband Regulator	4	522-5875-005
	78C2-MW Relay Unit	2	522-5882-004
	Jackfield	1	769-5140-001
Interface Group, OU-79(V)3/UC	Technical Control Equipment	1	616-4041-003
Terminal Board Assembly, J-3012/UC	Pin Block Assembly	1	764-5198-001
	Card Cage Assembly, wired and equipped for 24 attenuator pads	2	796-2189-001

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	DUNGIVEN STATION (Cont)		
Variable Attenuator, CN-1372/UC	0-31 dB Pad	24	796-2331-001
	Card Cage Assembly, wired and equipped for 12 attenuator pads	1	796-2189-001
Variable Attenuator, CN-1372/UC	0-31 dB Pad	12	796-2331-001
Telephone Jack Assembly J-3015/UC	VF and Circuit Patch Rack	1	
	Circuit Patch Jackfield	3	124-0057-434
Telephone Jack Assembly J-3016/UC	Circuit Patch Jackfield	2	124-0057-435
Telephone Jack Assembly J-3017/UC	Miscellaneous Jacks	1	124-0064-247
	VF Jackfield	3	124-0057-432
	VF Jackfield	2	124-0057-433
	Operator Shelf	2	
Multiplexer Set, AN/UCC-4(V)	Multiplexer Set (GFE)		
Equalizer Group, OA-8370(V)	Equalizer Rack	1	
Frequency-Power Supply Group, OA-8373(V)	Frequency-Power Supply Rack	1	
Multiplexer Group, OB-26(V)	Group/Supergroup Rack	1	
Multiplexer Group, OB-31(V)	Channel Multiplexer Rack	1	
	DC Power Plant	1	
	Battery Rack	1	
	Battery, Lead-Calcium, Exide ETC-9	24	
	Battery Charger Rack	1	
	50-Ampere Rectifier/Charger, Power Conversion Products, Inc., 3709C	2	
	Equipment Rack, 19''	1	
	Transistor Counter EMF Cell, Power Conversion Products, Inc.	1	

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	DUNGIVEN STATION (Cont)		
	Fuse Panel/Termination Panel/Ground Bar, Power Conversion Products, Inc.	1	
	Deluge Shower	1	
	Antenna Set	1	616-4022-014
Antenna Radome Set, AS-2650/GR	Antenna-Radome Set	1	616-0799-001
	6-Foot Parabolic Dish, Andrew PL6-71G/S	1	124-0064-245
	6-Foot Tower Mount, Andrew T4B	1	124-0064-236
	6-Foot Heated Radome, Andrew HR6C	1	124-0064-240
Waveguide Assembly, CU-3682/U	Waveguide Assembly	1	616-0800-025
	Elliptical Waveguide, 160 ft, Andrew EWP-71	1	124-0064-228
	2-Port Manifold, Andrew 6600A-2	1	
	Waveguide Dehydrator	1	
	LONDONDERRY STATION		
	Terminal Station (connected to Dungiven via existing microwave link)	1	610-4303-001
	Aux Rack	1	
Control-Monitor Set OK-177(V)1/GR	Ancillary Equipment	1	610-4304-001
	19D1-MW Power Distribution Panel	1	758-5536-001
Control Monitor Group, OK-81(V)18/GRC-169(V)	FA-102 Fault Alarm Receiver Set	1	774-4518-018
	Card Cage Assembly (Posn 76)	1	607-1945-001
	16N1-MW Power Converter	4	758-5544-001
	12B1-MW Power Regulator	2	758-5564-001
	28A1-23MW Tone Detector	1	758-5038-096
	28A1-24MW Tone Detector	1	758-5038-097
	Card Cage Assembly (Posn 79)	1	607-1975-001
	28A1-25MW Tone Detector	1	758-5038-098
	28A1-26MW Tone Detector	1	758-5038-099
	28A1-27MW Tone Detector	1	758-5038-100
	28A1-28MW Tone Detector	1	758-5038-101

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	LONDONDERRY STATION (Cont)		
	28A1-29MW Tone Detector	1	758-5038-102
	28A1-30MW Tone Detector	1	758-5038-103
	28A1-31MW Tone Detector	1	758-5038-104
	28A1-32MW Tone Detector	1	758-5038-105
	28A1-33MW Tone Detector	1	758-5038-106
	28A1-34MW Tone Detector	1	758-5038-107
	28A1-36MW Tone Detector	1	758-5038-109
Control Monitor Group, OK-81(V)17/GRC-169(V)	Fault Alarm Receiver	1	774-4518-017
	FA-102 Data Receiver	1	785-2024-001
	73A2-FA Register and Data Indicator (red lens)	17	522-5606-024
	73A1-FA Register and Data Indicator (green lens)	6	522-6654-063
	68A1-FA Shift Pulse Generator	1	522-6651-016
	68C1-FA Receiver Control Circuits	1	522-6653-023
	53A1-FA Tone Ampl. and Trigger	1	522-6650-023
	77A1-FA Coincidence Detector	1	522-5516-024
	73B1-FA Error Indicator	1	522-6655-023
	73D1-FA Major Alarm Indicator	1	522-6657-023
	80D2-FA Card Cage	1	766-7686-001
	80D8-FA Card Cage	1	522-5387-024
Control Monitor, C-8807/GR	18D1-FA Fault Alarm Control Panel	1	758-5407-003
Control Monitor Group, OK-81(V)16/GRC-169(V)	Fault Alarm Indicator	1	774-4518-016
	FA-102 Major Alarm and Local Indicator	1	518-906736-5
	73C2-FA Data Indicator	19	522-6656-017
	73D1-FA Major Alarm Indicator	1	522-6657-023
	78B1-FA Major Alarm Control	1	522-6660-023
	80D3-FA Card Cage	1	522-6662-025
	80D6-FA Card Cage	1	522-6782-015

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	LONDONDERRY STATION (Cont)		
	Audio Service Channel, Lenkurt	1	
	Inverter, DC to AC, Nova 2560-48	1	
	Inverter Relay Panel	1	
Interface Group, OU-79(V)4/GR	Technical Control Equipment	1	616-4041-004
	Card Cage Assembly, wired and equipped with 24 attenuator pads	1	796-2189-001
Variable Attenuator, CN-1372/UC	0-31 dB Pad	24	796-2331-001
	Card Cage Assembly, wired but not equipped for 24 attenuator pads	1	607-2158-001
	SF Rack	1	610-4304-002
	Technical Control Equipment	1	616-4041-004
Terminal Board Assembly J-3012/UC	Pin Block Assembly	3	764-5198-001
Power Distribution Panel SB-3578/UC	Power Distribution Panel	1	789-0448-005
Oscillator Distribution Group OA-8629(V)1/UC	Oscillator-Distribution Group	1	796-3943-001
	Card Cage	1	607-1872-001
	16N1-MW Power Converter	3	758-5544-001
	60D1-2MX Signaling Oscillator	2	522-6467-003
	Signal Tone Distribution Unit	1	566-6581-004
	Card Cage Assembly, wired and equipped with 12 20J2-MX SF Signaling Units	3	607-2158-001
Signal Converter CV-2856/UC	20J2-MX SF Signaling Unit	12	792-6238-001
	Card Cage Assembly, wired but not equipped with 12 20J2-MX SF Signaling Units	2	607-2158-001
	Card Cage Assembly, wired and equipped with 24 attenuator pads	3	796-2189-001
Variable Attenuator CN-1372/UC	0-31 dB Pad	24	796-2331-001
	Circuit Patch Rack	1	CP-101B

TABLE 1-6. (Continued)

NOMENCLATURE	EQUIPMENT	QTY PER ASSY	COLLINS PART NUMBER
	LONDONDERRY STATION (Cont)		
Part of Control Monitor Group, OK-81(V)16/ GRC-169(V)	Audible Alarm Panel	1	607-7196-001
Telephone Jack Assembly J-3015/UC	Circuit Patch Jackfield	4	124-0057-434
Telephone Jack Assembly J-3016/UC	Circuit Patch Jackfield	4	124-0057-435
	VF Patch Rack	1	CP-101A
	VF Jackfield	4	124-0057-432
	VF Jackfield	4	124-0057-433
	Operator Shelf	2	
	Miscellaneous Jackfield	2	124-0064-247
AN/UCC-4	Multiplexer Set	1	
Equalizer Group, OA-8370(V)	Equalizer Rack	1	
Frequency—Power Supply Group, OA-8373(V)	Frequency—Power Supply Rack	1	
Multiplexer Group, OB-26(V)	Supergroup/Group Multiplexer Rack	1	
Multiplexer Group (SG III), OB-31(V)	Channel Multiplexer Rack	1	
Multiplexer Group (SG II), OB-31(V)	Channel Multiplexer Rack	1	

TABLE 1-7. TEST EQUIPMENT REQUIRED AND SUPPLIED

NOMENCLATURE	MANUFACTURER	TYPE OR PART NUMBER
Thermistor	Hewlett-Packard	478A
Power meter	Hewlett-Packard	431C
Electronic counter	Eldorado	985
Oscillator	Hewlett-Packard	651B
Selective voltmeter	Sierra	128A
Multimeter	Triplett	630-NA
Telephone test set		AN/UCM-1
20/40 dB amplifier	Hewlett-Packard	450A
10-dB coaxial pad		
BNC T adapter (F-M-F)	Collins	357-9314-000
BNC-to-GR adapter	Collins	361-0148-000
BNC termination, 75-ohm	Collins	713-0031-000
BNC-to-WECo adapter	Collins	361-0149-000
Voltmeter	Hewlett-Packard	400L
Ac voltmeter	Hewlett-Packard	400E
Shf test set	Hewlett-Packard	620B
Waveguide-to-coax adapter	Hewlett-Packard	H281A
Rf voltmeter	Boonton	91H
Noise generator with filters	Marconi	TE-2091
Noise receiver with filters	Marconi	TE-2092
Pulse signaling test set	Northeast Electronics	TTS-26B

SECTION 2

INSTALLATION

2.1 INTRODUCTION

This section provides information for the installation and replacement of the major equipments supplied for the system. Paragraph 2.2 describes the location of the station equipment racks and references the station/shelter floor plans. Paragraph 2.3 provides receiving data. Paragraph 2.4 describes rack installation procedures and references the wiring tables and cable diagrams necessary for interrack and station wiring connections. Paragraph 2.5 describes subsystem installation procedures. Paragraph 2.6 outlines the visual inspection and checkout procedures for subsystems. Paragraph 2.7 describes turn-on procedures and precautions. Paragraph 2.8 references the initial alignment procedures for subsystems. Paragraph 2.9 explains how to prepare complete racks and subsystems for reshipment. Paragraph 2.10 provides reference to station floor plans, rack layouts, and plot plans. Paragraph 2.11 outlines the dc and ac power requirements for each station, subsystem and anciliary equipment.

2.2 RACK INSTALLATION PLANNING

Each rack is located in the position assigned on the applicable station/shelter floor plan. The location of the racks and the shelter type are determined by a microwave engineer, who considers such factors as space, ventilation, interfering rf or magnetic fields, adjacent equipment, and length of interconnecting signal cables. The station/shelter floor plans are contained at the end of Section 5. Figure 2-1 shows typical rack dimensions and equipment clearances.

2.3 RECEIVING DATA

Subsystems are normally shipped as part of a complete rack. Racks are shipped and crated either individually or in pairs. The crate is normally 6 inches larger in each dimension than the rack or racks contained. For rack dimensions, refer to table 1-4. Normally complete replacement of a rack is not required; instead, subsystems or damaged or defective modules are replaced. Replacement subsystems are normally contained in a single crate. For the specific weight and dimensions of each subsystem, refer to table 2-1.

2.4 RACK INSTALLATION

2.4.1 GENERAL

The following paragraphs contain a general description of the procedures required to install racks, cables, and waveguides. For specific details on individual site installation, refer to the installation drawings.

2.4.2 CHECKING BUILDING DRAWINGS AND LAYOUT

A careful inspection of building drawings is recommended to ensure correct installation. Check the layout and dimensions of the building and note the need for fabricating any special accessories, such as rack braces or special waveguide or antenna mounts, so they are available when actual installation begins.

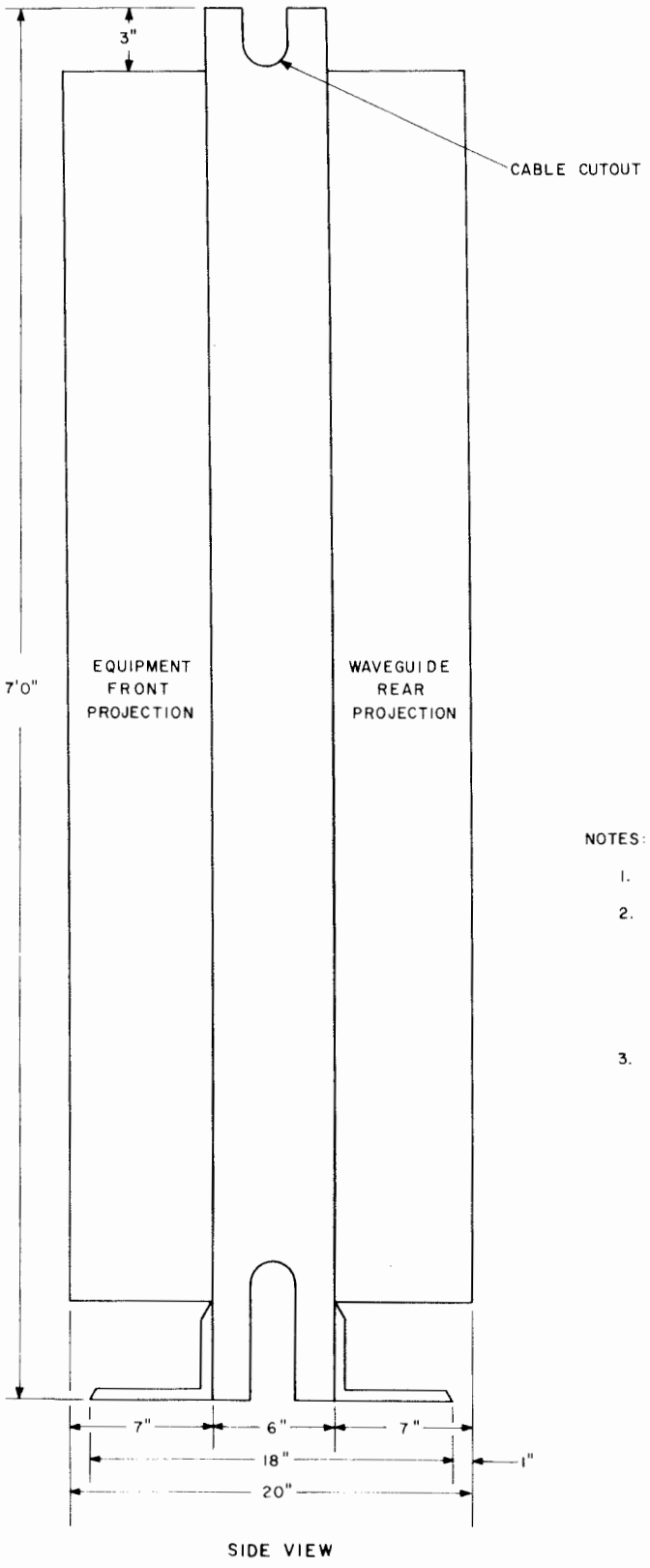
The frequencies of the transmitters and receivers at intermediate stations should be checked to see that they are compatible with the frequencies of the equipment at the next station. (Refer to tables 1-2 and 1-5.) To ensure that the equipment connects to the proper waveguides, it may be necessary to check the station plot plan (or table 1-5) to determine the direction of the radiated signal.

2.4.3 UNPACKING AND INSPECTING EQUIPMENT

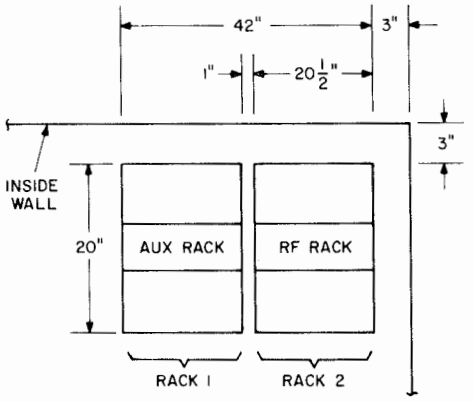
When the equipment arrives at an installation site, it should be unpacked and inspected in an area that is comparatively dry, free of dust, and as near the final rack location as possible. The following procedure is recommended:

a. Place the box on a level floor or table.

b. Remove the top and then the sides of the box with a crowbar or nail puller.



SIDE VIEW



TYPICAL MICROWAVE EQUIPMENT DIMENSIONS AND CLEARANCES

NOTES:

1. THE DIMENSIONS INDICATED ARE SUGGESTED AS A GUIDE FOR LOCATING THE MICROWAVE RACKS.
2. THE CABLE DRAWINGS AND THE ASSOCIATED CABLE SHEETS THAT CALL OUT THE CONNECTION POINTS FOR THE PREFABRICATED INTERRACK CABLES NORMALLY IDENTIFY THE RACK BY FUNCTION (AUX RACK, RF RACK 1, RF RACK 2, ETC) RATHER THAN BY RACK POSITION (RACK 1, RACK 2, RACK 3, ETC). DO NOT CONFUSE THESE DESIGNATIONS WITH STANDARD RACK NUMBERS.
3. WAVE GUIDE KITS ARE NORMALLY A PART OF THE STATION CONFIGURATION IPB.

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Figure 2-1. Typical Rack Dimensions and Equipment Clearances

TABLE 2-1. SUBSYSTEM WEIGHT AND DIMENSIONS

MAJOR EQUIPMENT	SPACES REQUIRED	WEIGHT (LBS)	DIMENSIONS (INCHES) WIDTH X HEIGHT X DEPTH
53E22C-( )MW Transmitter Subsystem — OT-11(V)/GRC-169(V)	9	50	19 x 17 x 14
55E22E-( )MW Receiver Subsystem — OR-22(V)/GRC-169(V)	8	25	19 x 17 x 14
65F1A-( )MW Transmit Converter — OU-37(V)/GRC-169(V)	7	75	19 x 12-1/4 x 14
50F11-( )MW TWT Power Amplifier — OG-56(V)/GRC-169(V)	7	75	19 x 12-3/8 x 20
55F30A-( )MW Receiver Subsystem — OR-22(V)/GRC-169(V)	8	65	19 x 17 x 14
90C2-MW Diversity Subsystem — OK-80(V)/GRC-169(V)	6	20	19 x 10-1/2 x 10-1/4
99G2-MW Coupling Subsystem — ON-57(V)/GRC-169(V)	9	40	19 x 7 x 10-1/4
90E2-MW 1:1 IF. Switch — OK-80(V)/GRC-169(V)	6	20	19 x 10-1/2 x 10-1/4
35A1-MW FM Terminal — OZ-3(V)/GRC-169(V)	6	50	19 x 10-1/2 x 15
Control Monitor Group — OK-81(V)/GRC-169(V)			
FA-102 Data Transmitter	4	38	19 x 7 x 9
Fault Alarm Receiver Set	21	95	19 x 19-1/2 x 26-3/4
FA-102 Data Receiver	4	37	19 x 7 x 9
18D1-FA Control Panel	5	10	19 x 9 x 8-3/4
Major Alarm and Local Indicator	4	32	19 x 3-1/2 x 9

TABLE 2-1. (Continued)

MAJOR EQUIPMENT	SPACES REQUIRED	WEIGHT (LBS)	DIMENSIONS (INCHES) WIDTH X HEIGHT X DEPTH
(13) 28A1-MW Tone Detector Units	4	1.75 ea.	1-3/8 x 6-1/4 x 10-1/4 ea.
90A1-MX Audio Service Channel — OW-32(V)/GRC-169(V)	3	15	19 x 5-1/4 x 7-3/4

c. Check the bottom of the box around the equipment for any parts that may have fallen from the equipment during shipment.

d. Unpack the rack assemblies before lifting the rack into a vertical position.

CAUTION

If a block and tackle is used to assist in steadying and raising the rack, care should be exercised in placing ropes or cables around the rack channels so as not to damage the units or warp the rack.

e. Raise the rack to a vertical position, using several men on each side of the rack and two men at the foot of the rack to prevent the base from slipping.

f. As soon as the equipment is unpacked, check it against the packing list. Inspect the equipment for physical damage, and, if there are any missing or damaged items, notify the transportation carrier and Collins Radio Company immediately.

g. At sites where two or more racks are bolted together, leave the shipping frame on until the final position of the racks is determined. This procedure provides protection and makes the racks easier to handle.

2.4.4 SECURING A RACK TO THE FLOOR

Several methods, depending on the type of floor, can be used to fasten racks to the floor. See figures 2-2 and 2-3 for typical baseplate hole patterns.

2.4.4.1 DRIVEN STUD METHOD

For concrete floors, the racks may be fastened to the floor either with studs driven into the floor by a stud driver (Remington Model 455A, or equivalent) or with lead anchors (Tampins).

WARNING

Exercise extreme caution when using a stud driver. In some instances, the stud may penetrate a wall, floor, or ceiling and fatally injure persons on the other side. Before firing a stud, check the opposite side of a wall, floor, or ceiling to be sure that firing a stud will not result in damage to equipment or injury to personnel. Read and become thoroughly familiar with the stud driver operating instructions before attempting to use it.

a. Line up the racks in the exact position they are to occupy. Where racks are to be placed side by side, align and bolt them together at the top, center, and bottom through the rack channels. If holes are not provided in the racks and must be drilled, place a cloth over the rack equipment to catch any metal shavings that may fall. Before drilling the holes, move all wire and cables away from the area to be drilled.

b. Check to see that the racks are plumb. Correct for any irregularity in the floor by placing shims under the base support of the racks.

c. On the rack baseplate, mark each hole with centerlines (lines drawn perpendicular to each other crossing at the center of the holes) in such a manner that they can be seen when the base of the stud driver is placed over the hole.

d. Make certain that the marks on the disc on the stud driver base are lined up with the marks on the stud driver base, and that the wingnut is securely fastened.

e. Line up the base of the stud driver over the hole so the alignment projections on the base of the stud driver lines up with any three of the centerlines. The upper portion of the driver may be rotated independently of the base to clear the rack sides or other projections.

Note

A practice shot should first be fired into the floor in some area away from the racks to determine the power load necessary to drive the stud into the particular flooring material.

f. Fire the stud directly through the baseplate hole into the floor.

g. The threaded stud should extend 1/2 to 3/4 inch above the rack baseplate. Improperly set studs can be pulled and new shots made (figure 2-4).

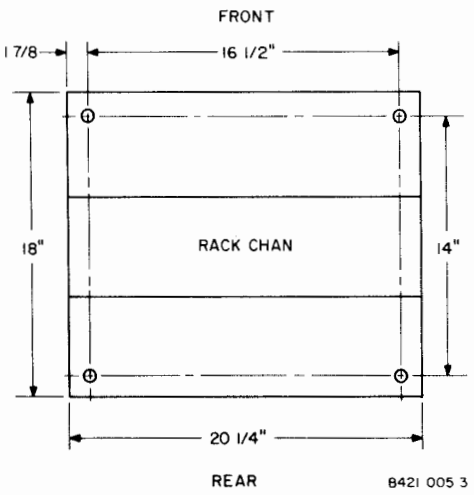

Figure 2-2. Typical Baseplate Hole Pattern

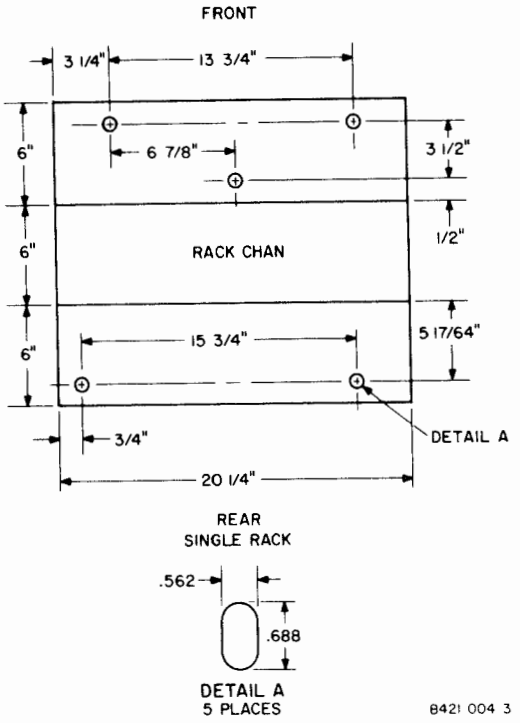

Figure 2-3. Roller Kit Baseplate Hole Pattern

h. After all studs are properly set, bolt the racks down using a flat washer, lockwasher, and nut on each stud.

2.4.4.2 LEAD ANCHOR METHOD

When Tampins or equivalent anchors are used for fastening rack assemblies to a concrete floor, the racks should first be properly lined up and plumbed. The anchors are then installed as follows:

a. Using the rack baseplate as a template, mark the position of each hole, preferably by starting the hole in the concrete with a small star drill or masonry drill.

b. Move the racks out of the way and drill all holes to the proper depth with a masonry drill of the proper diameter. Tampin holes should be drilled 1/4 to 1/2 inch deeper than the length of the Tampin.

c. Set the anchors using the Tampin tool.

d. Set the racks back in place and bolt them down using 3/8-inch-diameter bolts, flat washer, and lockwashers.

Racks may be bolted to wood or steel floors using 3/8-inch-diameter lag bolts or machine bolts. The rack is aligned and plumbed and the baseplate is used as a template for drilling the pilot hole for lag bolts or clearance holes for machine bolts.

Some provision should be made for adequate bracing at the top of the rack assemblies to ensure reliable support for the equipment. Three methods of bracing the top of the racks are illustrated in figure 2-5.

2.4.5 RACK CONDUIT ENTRIES

Conduit connection between the ac/dc square duct or the coax square duct and the equipment racks should be made using 1-inch flexible conduit. Standard conduit connectors and Bakelite conduit bushings should be used for coupling the conduit

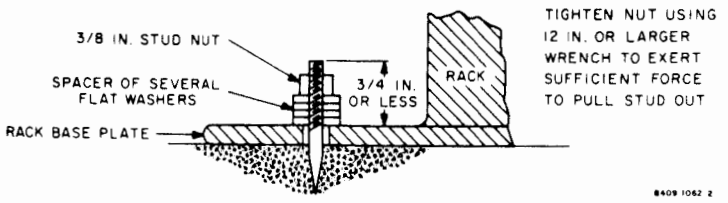

Figure 2-4. Removing Improperly Set Stud

to the duct or equipment rack. The conduit connection to the top of the equipment rack should be made to a conduit termination plate which is installed as follows:

a. Determine the number of conduit termination plates required for power entries and coax entries. Normally, when facing the rear of the equipment rack, the power conduit enters on the right side and the coax conduit enters on the left side. Thus, the termination plates should be grouped on the left side and right side.

b. Using the termination plates as templates, lay out and center punch the termination plate mounting holes on the front and rear rack top bars. Keep the top of the plates flush with the top of the rack when performing this step.

c. Remove the plates and drill number 8 clearance holes (number 19 drill) through the rack top bars. Be certain that the rack equipment is well protected against falling metal shavings before drilling the mounting holes.

d. Mount the conduit termination plates using 8-32 by 1/2-inch nickel-plated, binder-head screws, lockwashers, and nuts.

When connecting the conduit to the rack, be certain that the conduit is long enough to ensure uniform curvature of all the conduit drops in the rack line.

Conduit drops to equipment cabinets are made in the same manner as outlined above except that the conduit termination plate is not required. Instead, the conduit is connected to knockouts in the top of the cabinet.

2.4.6 CABLING AND WIRING

Prefabricated cables are supplied to make all interrack connections. Connection points are identified by the interrack cable diagrams and the to/from wiring charts located in section 5 of this manual. These connections are to be made first. The following instructions are for external connections. Refer to table 2-2 for a list of rf interrack cables, table 2-3 for multiplex interrack cables (supplied as part of the installation drawings), and table 2-4 for the multiplex-rf interface drawings.

2.4.6.1 RUNNING CABLE

When installing a station, the cabling should be separated into at least three categories. The first to be considered should be the common grounding system, then the switch board type cabling, and finally the coaxial cabling. The cable size, type, and code, and where the cables are to be placed can be obtained from the appropriate drawings in section 5. The following suggestions may simplify the installation:

a. It may be possible to set up two or more reels of cable and run them together where the same or adjacent destinations are specified. When possible, run all cables of the same type or code while the reels are set up to reduce the time consumed in changing reels.

b. Select the correct type and code of cable from the cabling installation drawing and set up the reel for starting the cable run. Attach a duplicate cable tag at a point 1 or 2 feet from the end of the cable and proceed with placing the cable on the cable rack and frames as outlined on the installation drawings.

c. At the equipment where the cable is to be terminated, allow a minimum of 2 feet excess length for butting, strapping, and fanning. Secure the cable with a temporary tie at this point and work the slack out of the cable from the terminating end towards the cable starting point, making temporary ties of the cables in their

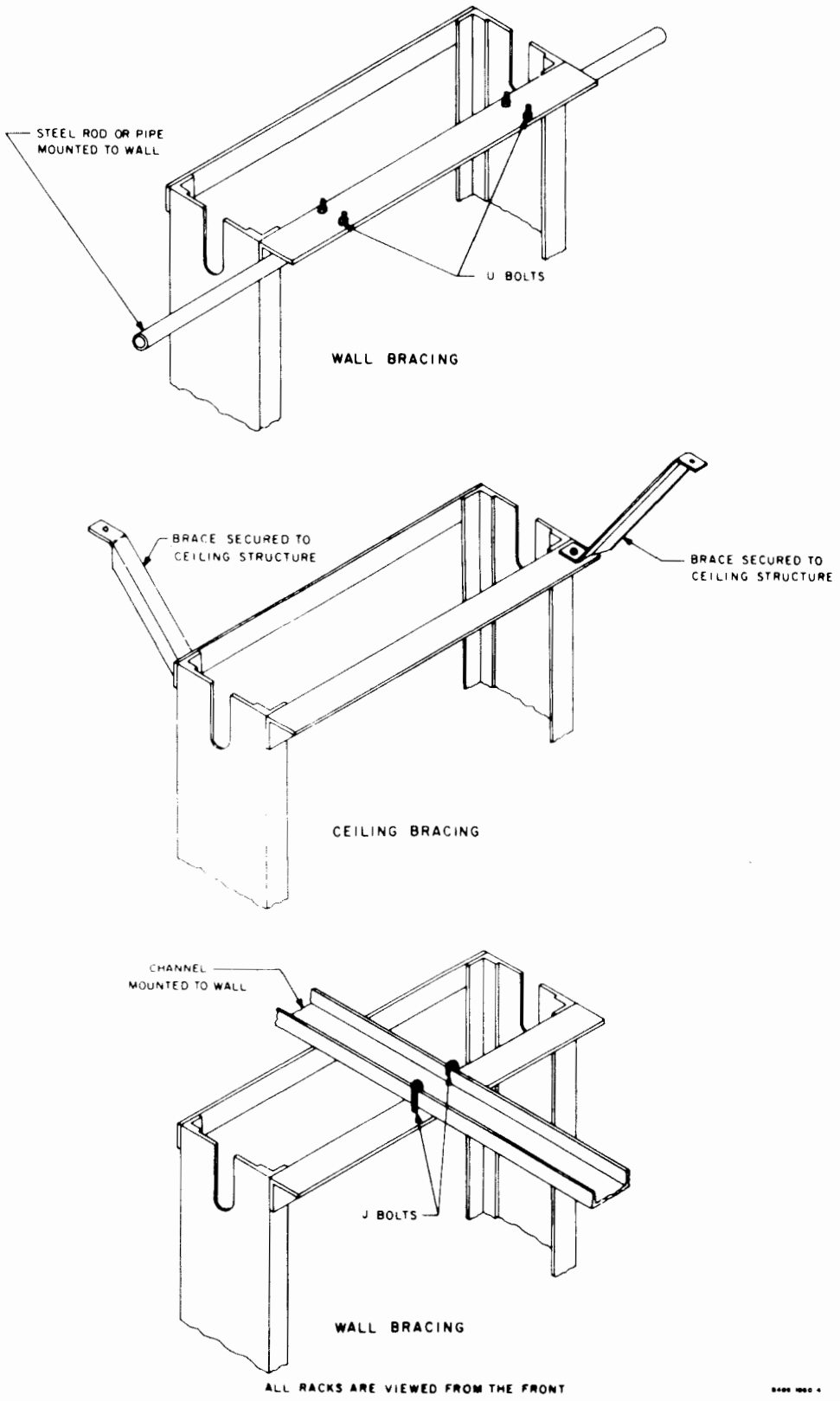

Figure 2-5. Methods of Bracing Top of Racks

TABLE 2-2. RF INTERRACK CABLES

CABLE NUMBER	CABLE DRAWING NUMBER	FUNCTION	THURSO	LATHERON	MORMOND HILL	ABERDEEN	INVERBERVIE	KINNABER	EDZELL	CRAIGOWL HILL	EAST LOMMOND	KIRK O'SHOTTS	SERGEANT LAW	BROWN CARRICK	SLIEVEANORRA	DUNGIVEN	LONDONDERRY
607-2112-001	607-2113-001	Interrack, Signal	X						X								
607-2130-001	607-2131-001	Interrack, Alarm, RF Rack to Aux Rack	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
610-4333-001	610-4334-001	Interrack, Alarm	X						X								X
607-2132-001	607-2133-001	Interrack, Alarm, RF Rack to RF Rack		X	X	X	X	X		X	X	X	X	X	X		
610-4335-001	610-4336-001	Interrack, Signal				X	X										
607-2114-001	607-2115-001	Interrack, Signal		X													
607-2134-001	607-2135-001	Interrack, Signal			X												
607-2116-001	607-2117-001	Interrack, Signal								X	X	X	X				
607-2128-001	607-2129-001	Interrack, Signal						X									
607-2120-001	607-2121-001	Interrack, Signal												X			
610-5727-001	610-5728-001	Interrack, Signal													X		
607-2118-001	607-2119-001	Interrack, Signal														X	

TABLE 2-3. MULTIPLEX INTERRACK CABLES

CABLE NUMBER	CABLE	THURSO	EDZELL	DUNGIVEN	LONDONDERRY
Note Refer to composite interrack cable drawing 616-0784-001 for Londonderry, 616-0786-001 for Thurso and Edzell, and 616-0788-001 for Dungiven. (All multiplex drawings are supplied as part of the installation drawings.)					
607-8792-001	Common Equipment Rack to Common Equipment Rack P1 through P12	X	X	X	X
607-8792-002	Channel Rack to Common Equipment Rack J1 through J12	X	X	X	X
607-8794-001	Common Equipment Rack to Common Equipment Rack P13 through P17	X	X	X	X
607-8794-002	Group/Supergroup Rack to Common Equipment Rack J13 through J17	X	X	X	X
610-8464-001	Common Equipment Rack to Common Equipment Rack P205	X	X		X
610-8464-002	Group/Supergroup Rack to Common Equipment Rack J205	X	X		X
610-8474-001	Common Equipment Rack to Common Equipment Rack P207	X	X		X
610-8474-002	Channel Rack to Common Equipment Rack J207	X	X		X
610-8476-001	Common Equipment Rack to Common Equipment Rack P208	X	X	X	X
610-8476-002	Channel Rack to Common Equipment Rack J208	X	X	X	
610-8476-002	Group/Supergroup Rack to Common Equipment Rack J208				X
607-8784-001	Group/Supergroup Rack to Group/Supergroup Rack P202	X	X		X
607-8784-002	Channel Rack to Group/Supergroup Rack J202	X	X		X

TABLE 2-3. (Continued)

CABLE NUMBER	CABLE	THURSO	EDZELL	DUNGIVEN	LONDONDERRY
607-8786-001	Group/Supergroup Rack to Group/Supergroup Rack P203	X	X		X
607-8786-002	Channel Rack to Group/Supergroup Rack J203	X	X		X
607-8816-001	Delay Equalizer Rack to Delay Equalizer Rack P106 through P110	X	X		
607-8816-002	Channel Rack to Delay Equalizer Rack J101 through J105	X	X		
607-8820-001	Delay Equalizer Rack to Delay Equalizer Rack P101 through P105	X	X		
607-8820-002	Channel Rack to Delay Equalizer Rack J106 through J110	X	X		
616-4068-001	Common Equipment Rack to Common Equipment Rack P33, P34	X	X	X	X
616-4068-002	Group/Supergroup Rack to Common Equipment Rack J33, J34	X	X	X	X
607-8782-001	Common Equipment Rack to Common Equipment Rack P18 through P20			X	X
607-8782-002	Group/Supergroup Rack to Common Equipment Rack J18 through J20			X	X
610-8466-001	Common Equipment Rack to Common Equipment Rack P205			X	
610-8466-002	Channel Rack to Common Equipment Rack J205			X	
610-8478-001	Common Equipment Rack to Common Equipment Rack P203			X	
610-8478-002	Channel Rack to Common Equipment Rack J203			X	
607-8798-001	Group/Supergroup Rack to Group/Supergroup Rack P201			X	

TABLE 2-3. (Continued)

CABLE NUMBER	CABLE	THURSO	EDZELL	DUNGIVEN	LONDONDERRY
607-8798-002	Channel Rack to Group/Supergroup Rack J201			X	
607-8790-001	Group/Supergroup Rack to Group/Supergroup Rack P202			X	
607-8790-002	Channel Rack to Group/Supergroup Rack J202			X	
607-8470-001	Delay Equalizer Rack to Delay Equalizer Rack P106 through P110			X	
610-8470-002	Channel Rack to Delay Equalizer Rack J106 through J110			X	
610-8472-001	Delay Equalizer Rack to Delay Equalizer Rack P101 through P105			X	
610-8472-002	Channel Rack to Delay Equalizer Rack J101 through J105			X	
610-8462-001	Channel Rack to Channel Rack P21 through P32				X
610-8462-002	Channel Rack to Channel Rack J21 through J32				X
610-8468-001	Common Equipment Rack to Common Equipment Rack P206				X
610-8468-002	Channel Rack to Common Equipment Rack J206				X
610-8480-001	Channel Rack 4 to Channel Rack 4 P209				X
610-8480-002	Channel Rack 5 to Channel Rack 4 J209				X
610-5758-001	Group/Supergroup Rack to Group/Supergroup Rack P204				X
610-5758-002	Channel Rack to Group/Supergroup Rack J204				X
610-5756-001	Group/Supergroup to Group/Supergroup Rack P201				X
610-5756-002	Channel Rack to Group/Supergroup Rack J201				X

TABLE 2-3. (Continued)

CABLE NUMBER	CABLE	THURSO	EDZELL	DUNGIVEN	LONDONDERRY
607-8806-001	Delay Equalizer Rack to Delay Equalizer Rack P116 through P120				X
607-8806-002	Channel Rack 4 to Delay Equalizer Rack J116 through J120				X
607-8818-001	Delay Equalizer Rack to Delay Equalizer Rack P106 through P110				X
607-8818-002	Channel Rack 5 to Delay Equalizer Rack J106 through J110				X
607-8804-001	Delay Equalizer Rack to Delay Equalizer Rack P101 through P105				X
607-8804-002	Channel Rack 5 to Delay Equalizer Rack J101 through J105				X
607-2200-001	Delay Equalizer Rack to Delay Equalizer Rack P111 through P115				X
607-2200-002	Channel Rack 5 to Delay Equalizer Rack J111 through J115				X
624-0695-001	Alarm Power Wiring	X	X	X	
624-0693-001	Alarm Power Wiring				X

TABLE 2-4. INTERFACE CABLES

CABLE NUMBER	DRAWING NUMBER	CABLE
616-4194-001	616-4193	RF to Multiplex, Thurso Station
616-4196-001	616-4195	RF to Multiplex, Edzell Station
616-4198-001	616-4197	RF to Multiplex, Dungiven Station
616-4200-001	616-4199	RF to Multiplex, Londonderry Station

permanent location at turns, bends, and where the cable drops occur.

d. Allow a minimum of 2 feet excess length at the starting end of the cable for butting, stripping, and fanning. Attach the remaining duplicate cable tag at a point where the butt location is to be made and cut the cable.

e. Keep all layers in a cable run as even as possible. Arrange two or more small cables in a layer when necessary to maintain a uniform height with cables of a large size.

f. Verify that all cables are placed, located, and routed in accordance with installation drawings before proceeding with final tying and lacing.

2.4.6.2 HANDLING CABLING AND WIRING

The following procedures are suggested for handling rack wiring and cabling:

a. Handle cable and wire carefully so that the shape and condition of the cable or wire are not altered. Tape ends of shielded wires or cables before running them into equipment rooms that contain operating equipments. Exercise caution when handling cable or wire at fuse panels. At racks or cabinets, protect relays and wiring when running cables. Provide protection at corners and sharp edges so that cable insulation is not damaged.

b. Arrange cables to lie side by side and secure them to the cable runway. All cables that turn off from the runway to the distribution frame, relay racks, or equipment cabinets, etc., should lie in proper sequence so there is no crossover of cables.

c. Layers of cable in the cable runway should be piled no higher than the depth of the runway.

d. Bends should be formed gradually by hand so no excessive strain is placed on the cable at any one point. Uniformity should be maintained at all bends, turns, and offsets.

e. Cables entering at the top of equipment racks should be secured to a tie bar. The tie bar should be located in the rack channel just above the point at which the cables are to be butted for sewing in a form to the terminal blocks.

2.4.6.3 CABLE DROPS

The following procedures are recommended for making cable drops from the cable tray to equipment racks:

a. A 4-inch radius should be maintained at all cable bends. Use extreme care in making bends where the cable drops from the cable tray.

b. Vertical drops of cables should be kept plumb and parallel in both planes. Cables should be formed in the tray to allow them to drop straight down to the equipment racks or cabinets.

c. Vertical drops of cables should be temporarily supported, then permanently tied so that kinks are not formed on the inner radius of the bend or at the point of last support in the cable tray.

d. All cable lacing should be uniform on all cable drops to equipment racks. Spacing between cable ties on vertical drops should not exceed 10 inches and should be equally spaced.

2.4.6.4 CABLE LACING

2.4.6.4.1 LACING CORDS

Use round white nylon cord and flat nylon lacing tape in lacing applications.

The following information may assist in obtaining either type lacing material:

Nylon lacing cord, no. 32, Frank W. Winne and Son, Inc., Dallas, Texas, Collins part number 435-1014-000.

Braided nylon lacing tape, natural, style 18, A and A Plastic Co., Dallas, Texas, Collins part number 435-1019-000.

Either a single or double strand, as specified in the following paragraphs, of the white round nylon cord is used to lace most wiring cable forms.

CAUTION

The flat nylon tape is used on any cable where the wire might be cut or damaged by the round cord. Flat tape should always be used when lacing coaxial cable.

2.4.6.4.2 GENERAL LACING PROCEDURES

The following procedures are recommended for lacing cables and wiring:

a. Lace cable forms of 1/4 inch to 1/2 inch diameter with two strands of round cord or one strand of flat cord with stitches evenly spaced and approximately 1/2 inch apart.

b. Lace cable forms larger than 1/2-inch diameter with two strands of round cord or one strand of flat cord with stitches evenly spaced and approximately 1/2 inch apart.

c. Lace cable forms less than 1/2 inch diameter with one strand of round or flat nylon cord. The stitches should be evenly spaced and approximately 1/2 inch apart.

d. Avoid lacing coaxial cables; if necessary, lace the cable loosely with the flat cord only. Tight lacing of coaxial cable may cause a change in the characteristic impedance of the cable. An alternate method is to tape the cables with bands of Scotch electrical tape every 4 to 6 inches.

e. Make a double stitch at each breakout point on a cable except where there are only one or two wires in a breakout.

2.4.6.4.3 STARTING, LACING, AND ENDING STITCHES

The following procedures are recommended when lacing cables and wiring in equipment racks. See figure 2-6 for an illustration of the various stitches referenced below.

a. Make the starting stitch as shown in figure 2-6 for single and double strand lacing.

b. When lacing a single cable, use the lock stitch.

c. The ending stitch is formed by two lock stitches close together.

Superimposed or overlay cables should be laced to the main form as shown in figure 2-7. The size of cord and spacing of the stitches should agree with the specifications of the previous paragraphs.

2.4.6.5 CONNECTING WIRES

2.4.6.5.1 VINYL-COVERED, TWISTED, AND SHIELDED WIRING

The following procedure is recommended for stripping and preparing vinyl-covered, 2-conductor, twisted and shielded wire for termination:

a. Determine the length of conductor required beyond shield breakout point.

b. Cut vinyl outer sheath from cable by making a circular cut. Be careful not to cut into the shield braid.

c. With a scribe or other pointed instrument, separate 10 or 12 strands from the shield braid. Pull the twisted conductors off to one side and cut off the excess shield braid (figure 2-8). Care should be taken to prevent breaking the braid strand or damaging the conductor insulation.

d. Twist the braid strands together, cut the twisted strands and conductors to the exact length required, and terminate.

2.4.6.5.2 COAXIAL CABLE WIRING

The following procedure is recommended for terminating coaxial cable with BNC series connectors:

a. Trim off 5/16 inch of the outer vinyl jacket. Make a circular cut, being careful not to cut into the braided shield. See figure 2-9A.

b. Slide the nut, adapter, bushing, and ferrule onto the cable as shown in figure 2-9B.

c. Comb out the braided shield and fold back over the ferrule. Cut off the inner dielectric, leaving 1/8 inch protruding beyond the shield braid. Trim the center conductor to 1/8 inch and tin with a small soldering iron.

d. Cut off the shield braid at the point indicated by the arrows in figure 2-9C, and solder the tip

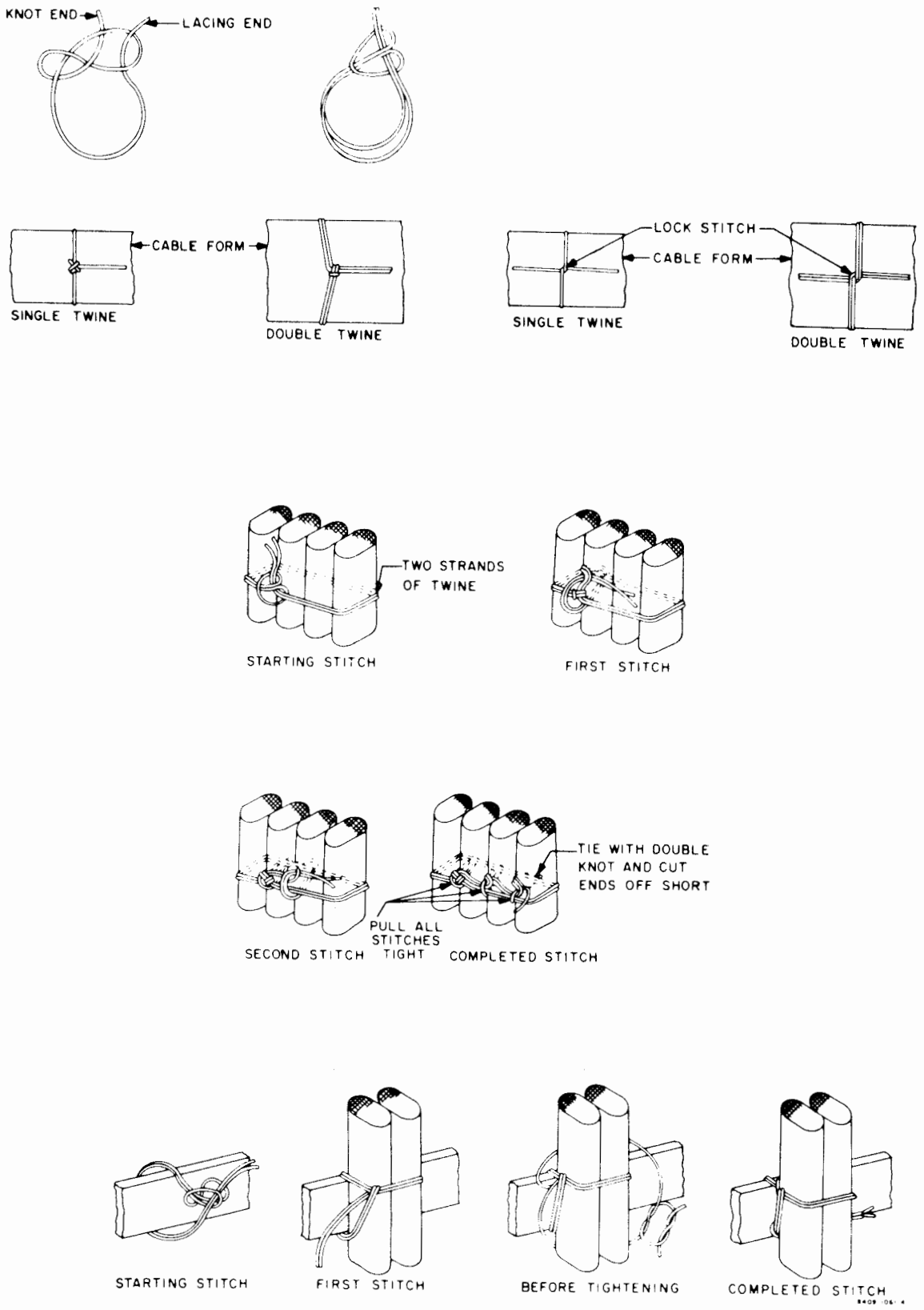

Figure 2-6. Cable Lacing Stitches

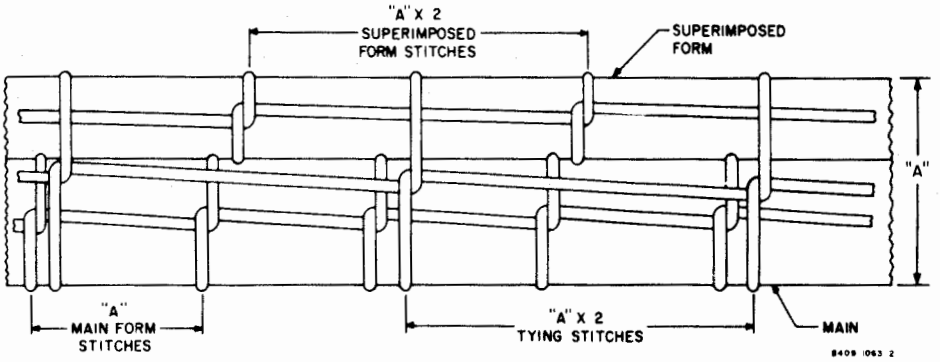

Figure 2-7. Superimposed Cable Lacing

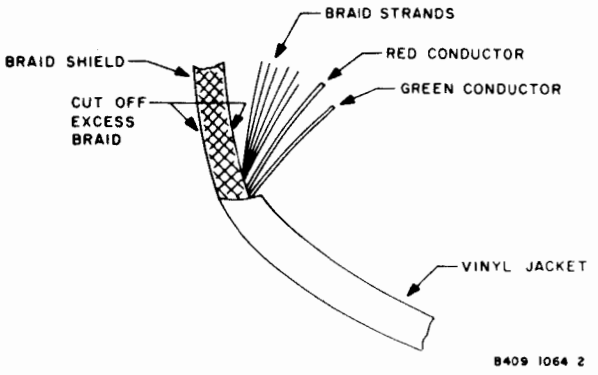

Figure 2-8. Cable Termination Procedure for 2-Conductor, Twisted, Shielded Wire

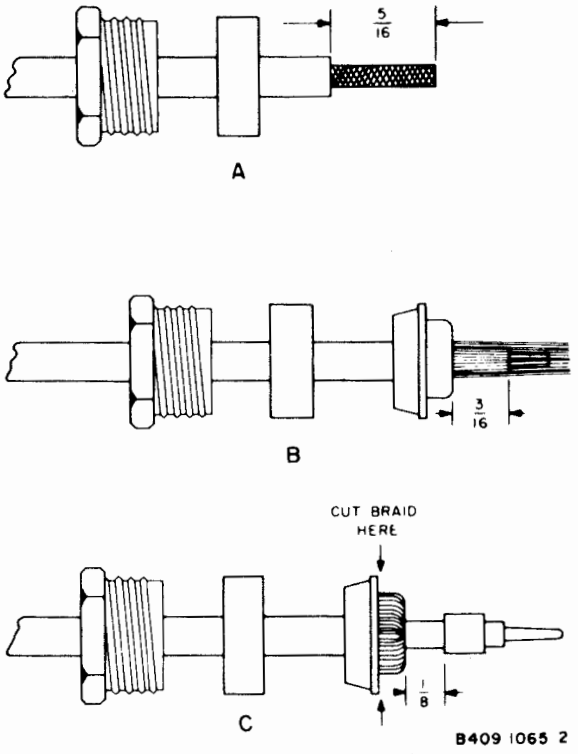

Figure 2-9. Cable Termination With Amphenol Connector

contact to the center conductor using minimum heat and solder. Remove any excess solder or rosin.

e. Insert this assembly into the plug body. Slide the nut into the body and screw tightly into place using a 3/8-inch wrench to hold the inner plug body and a second 3/8-inch wrench on the nut.

f. Check that the contact tip is flush with the front of the plug body.

2.4.6.6 TERMINAL STRAPS, CONNECTIONS, AND CROSS CONNECTIONS

2.4.6.6.1 STRAPPING PROCEDURES

Straps are generally classified as individual or common. Individual straps connect two terminals on the same apparatus such as a terminal block, jack strip, or coil. Common straps are continuous lengths of wire used to connect three or more terminals that are adjacent. The following procedure is recommended for strapping:

a. Straps should be connected to the apparatus before other wiring is placed or terminated, unless otherwise specified in the installation drawings.

b. The terminals to be strapped should be clean and free of dust or grease.

c. Straps should be placed to permit access to the apparatus for maintenance, inspection, or removal of the apparatus with a minimum of disturbance to other wiring.

d. Straps at terminal strips should be placed and soldered at the inner notch of the terminal where such terminals are provided.

e. Either bare or insulated, solid, tinned, copper wire should be used for strapping.

f. Bare tinned copper wire should be used only where the straps are on adjacent terminals. Insulated or sleeved tinned copper wire should be used between alternate terminals, power terminals, or terminals separated by more than 1/2 inch.

g. No. 22 gauge wire should be used for all strapping on the same apparatus except where a larger gauge of wire strap is specified for mechanical or electrical reasons.

h. No. 20 or no. 18 wire should be used for maintaining rigidity between terminals when the load wire is of the same gauge wire.

2.4.6.6.2 CONNECTING PROCEDURES

The terminal or pins of a terminal strip are generally identified by the assignment of an identifying number. When the terminal strip is mounted vertically, the numbers start at the top and are consecutively numbered from right to left in horizontal rows, as viewed from the front and left side. When viewed from the right side of the terminal strip, the numbers are consecutive from left to right across the entire terminal strip. The following connecting procedures are recommended when wiring into a terminal strip or pin block:

a. The installer should verify that the proper cable is terminated at the location where the connecting operation is to start.

b. Precautions should be taken to prevent paired conductors from becoming untwisted and thus losing their identity.

c. To determine the point to remove insulation from the wire, pull the conductor that connects to the number 1 terminal to the front edge. The point where the conductor bends over the terminal edge is where the insulation should be removed.

d. When connecting the strapped wires to a row of terminals, start with the number 1 terminal and make connections in sequence back toward the fanning strip.

e. To connect the wire to a terminal, grip the wire end with a pair of long-nosed pliers and bring the wire up and under into the notch of the terminal; make one complete wrap of the bare wire around the terminal and cut away the excess wire at the front edge of the terminal.

f. Connections to the terminals should be checked for continuity and for correct termination before soldering any connection.

g. Bare copper conductors should be soldered within 24 to 36 hours after making the connections to avoid soldering problems due to oxidation of the copper.

2.4.6.6.3 CROSS-CONNECTING PROCEDURES

Cross-connections are commonly referred to as jumper wires and are used to connect terminals that are located a considerable distance apart. The jumper wires should be made long enough to permit 3 inches of slack in the jumper after the connections have been made to the terminals. Information for installing cross-connections should be obtained from the specifications and drawings for the station.

2.5 SUBSYSTEM INSTALLATION

2.5.1 GENERAL

The subsystems are located in the space assigned by the microwave system engineer as indicated by the applicable rack layout drawings. The necessary wiring to and from the subsystem shall be installed and connected as indicated in the applicable cable sheets and external connections diagrams. The rack layout drawings are contained at the end of section 5.

2.5.2 INSTALLATION OF A COMPLETE SUBSYSTEM

Use care in the delivery and unloading of the equipment. Be sure that the correct equipment and all the items called for are at the site. Pay particular attention to the condition of all packages, and report any damaged items to the shipper and delivery agent immediately. After the equipment is unloaded, proceed as follows:

a. Place the box on a level floor or table.

b. Use a crowbar or nail puller to remove the top of the box; then remove the sides.

c. Inspect the bottom of the crate for any parts that may have fallen from the equipment during shipment.

d. If power connections to the rack have already been made, ensure that power to the rack is turned off.

e. Locate and temporarily mark the rack space designated for the subsystem.

f. Place the subsystem in the marked position, and align the mounting holes. Support the weight of the unit and use the screws provided with the subsystem to secure the subsystem to the rack. Continue to support the unit until all mounting screws are secured. If the weight of the subsystem is allowed to depend upon two or three mounting screws during installation, the tapped holes in the rack may be damaged.

g. Install the wires and cables indicated by the applicable cable sheet and make the necessary connections according to the interrack cable and wiring charts.

h. Connect the waveguide to the antenna mainline, if applicable.

2.5.3 REPLACEMENT OF A COMPLETE SUBSYSTEM

If it becomes necessary to replace the subsystem, the following instructions should be followed. Use care in the delivery and unloading of the equipment. Be sure that the correct equipment and all the items called for are at the site. Pay particular attention to the condition of all packages, and report any damaged items to the shipper and delivery agent immediately. After the equipment is unloaded, proceed as follows:

a. Place the box on a level floor or table.

b. Use a crowbar or nail puller to remove the top of the box; then remove the sides.

c. Inspect the bottom of the crate for any parts that may have fallen from the equipment during shipment.

d. Before removing the subsystem from the rack, be sure all power is removed from the equipment rack. Carefully mark and disconnect the cable and wires between the shelf and the rack. Disconnect the waveguide from the mainline waveguide at the waveguide shutter, if applicable.

e. Support the weight of the subsystem and remove the mounting screws. Remove the subsystem from the rack.

f. Place the new subsystem in the same position on the rack. Use the same screws that were removed from the old subsystem. Support the weight of the unit until all of the mounting screws are secured. If the weight of the subsystem is

allowed to depend upon two or three mounting screws during installation, the tapped holes in the rack may be damaged.

g. Reconnect the wires and cables disconnected in step d. Refer to the interrack cable and wiring diagrams if required.

h. Connect the waveguide to the antenna mainline, if applicable.

i. Pack the old subsystem in the received crate for shipment to a maintenance center. (See paragraph 2.9.2.)

2.5.4 REPLACEMENT OF A PLUG-IN MODULE

Pay particular attention to the condition of packages containing modules, and report any damaged items to the shipper and delivery agent immediately. After inspection of the received package is complete, proceed as follows:

a. Carefully unpack the module.

b. Inspect the module for missing parts or damage incurred in shipment.

c. Inspect the packing container for parts or other items before discarding.

d. Operate the power on/off switch on the power and control unit (if applicable) to the off position.

e. Remove the module to be replaced from the subsystem shelf by pulling outward on the plastic or metal handle. (If a power and control unit is to be removed, first loosen the four locking screws and pull the unit out of the card cage.)

CAUTION

Before installing a new module, consult the schematic diagram for possible strapping options, and strap the unit as required.

f. Insert the new module and ensure the module is properly seated in the card cage connector.

g. After the module is properly mounted in the subsystem, perform the alignment and adjustment procedures as specified in the applicable commercial manual maintenance section.

h. Pack the old module in the received container for shipment to a maintenance center.

2.5.5 REPLACEMENT OF A SOLID-STATE SOURCE

When it becomes necessary to replace a solid-state source, the following procedure is recommended:

a. Operate the ON/OFF switch on the power and control unit to OFF.

b. Disconnect the solid-state source output coaxial cable from the solid-state source.

c. Unplug the solid-state source power cable.

d. Remove the screws that secure the solid-state source to its mounting bracket, and remove the solid-state source.

e. Remove crystal from solid-state source and reinstall in the replacement source.

f. Mount the replacement source to the mounting bracket with the proper size screws.

g. Plug in the power cable.

h. Connect the output coaxial cable.

i. Operate the ON/OFF switch on the power and control unit to ON.

j. Perform the alignment procedures outlined in the commercial manual to restore the subsystem to normal operation.

2.6 VISUAL INSPECTION OF SUBSYSTEMS

Before energizing a newly installed subsystem, perform the following visual inspection routine to ensure the subsystem has been properly installed and that the equipment has not been tampered with.

2.6.1 55E22E-( )MW RECEIVER SUBSYSTEM

a. Check that the coaxial cable connection to if. amplifier jacks J25, J27, and J28 are fully engaged and firmly tightened.

b. Check that a 75-ohm termination is connected to jack J26.

c. Check that all screws on terminal board TB201 are tight.

d. Check that the 51G1A-MW Mixer/Amplifier mounting screw is tight.

e. Check that the looping plugs are installed between the B/B OUT and TRK 1 IN and between the B/B AUX OUT and TRK 2 IN jacks.

f. Check that all subsystem modules are firmly seated in their card cage connectors.

2.6.2 53E22C-( )MW TRANSMITTER SUBSYSTEM

a. Check that the klystron power and control unit, the modulation amplifier, and the afc unit are fully inserted into the card cage.

b. Check the following cables for proper connection:

1. Power cable to the 23K2-MW AFC Unit.

2. Looping plug is inserted between KLY IN and MOD OUT jacks on the transmitter panel.

3. Plug P104 to the 70-MHz output on the 23K2-MW AFC Unit.

4. RF PWR MON cable to the power monitor assembly.

c. Observe that the coolant level comes to the centerline of the upper sightglass on the ebullator condensor assembly. If coolant is required, perform the steps of SSM-173, Subsection 10, Klystron Coolant Level Check (contained in the 508D commercial manual).

2.6.3 55F30A-( )MW RECEIVER SUBSYSTEM

a. Set the waveguide shutter control to CLOSED.

b. Operate the ON/OFF switch on the power and control unit to OFF.

c. Loosen the captive screws on the waveguide flange between the shutter assembly and the preselector filter.

d. Loosen the two locking screws on the receiver waveguide tray assembly and slide the tray forward.

e. Check the coaxial cable to the mixer/preamplifier for proper connection.

f. Check and firmly tighten all TNC connectors on the rear of the card cage.

g. Remove the 16M1B-MW Receiver Power and Control Unit and check all screws on TB1 for tightness. Reinstall the 16M1B-MW.

h. Check that all modules are firmly seated in the card cage.

i. Check that all looping plugs are properly installed in the jackfield.

j. Slide in the receiver waveguide assembly and tighten the screws in the waveguide flange between the shutter assembly and the receiver preselector filter.

k. Tighten the front panel screws. Set the shutter control to OPEN.

2.6.4 65F1A-( )MW TRANSMIT CONVERTER SUBSYSTEM

a. Loosen the two locking screws on the waveguide tray assembly, and loosen one-half turn the two type N connectors on the coaxial cable between the transmit converter output and the twt power amplifier input; slide the tray assembly forward.

b. Check and firmly tighten the coaxial cable connection between the solid-state local oscillator output and the waveguide-to-coax adapter input.

c. Check that the 51F3-MW 70-MHz Amplifier mounting screws are tight.

d. Check all screws on TB1 for tightness. (Remove the 16L1A-MW Power and Control Unit to gain access to the card cage-mounted terminal.)

e. Check that all modules are properly fitted into the card cage.

f. Observe that looping plugs are installed between PAD/EQ IN and 70 MC TRK OUT, 70

MC AMPL IN and PAD/EQ OUT, and TX L.O. IN and INSERT AMPL OUT.

g. Slide the tray assembly into place, tighten the two type N coaxial connectors loosened in step a., and tighten the two tray assembly locking screws.

2.6.5 50F11-( )MW TWT POWER AMPLIFIER

a. Close the waveguide shutter by turning the shutter control clockwise.

b. Press the STANDBY button on the twt power supply unit under inspection.

c. Loosen the captive screws on the waveguide flange between the shutter assembly and the 5-cell bandpass filter.

d. Loosen the two locking screws on the twt power amplifier waveguide tray assembly. Loosen the two type N coaxial connectors one-half turn on the coax between the twt power amplifier input and the transmit converter output. Slide the tray forward.

e. Make sure connector plug P6 from the primary power source is tightly secured to the twt power supply unit.

f. Make certain that main power plug P1 from the twt power supply unit is securely fastened to its mating receptacle on the waveguide tray assembly.

g. Ensure that main power plug P2 from the twt is securely fastened to its mating receptacle on the waveguide tray assembly.

h. Make sure the detector assembly connected to the power monitor unit and the BNC connector on the detector output are tight.

i. Slide the twt power amplifier waveguide tray assembly back into the cabinet.

j. Tighten the screws in the waveguide flange between the shutter assembly and the 5-cell bandpass filter. Tighten the two locking screws on the waveguide tray assembly. Tighten the two type N coaxial connectors on the twt power amplifier input cable.

k. Press the RESET button on the twt power supply unit.

l. If the twt power amplifier has been previously tuned and aligned, open the waveguide shutter; otherwise, leave the shutter closed until the twt has been properly adjusted according to the procedures outlined in the appropriate commercial manual maintenance section.

2.6.6 90C2-MW DIVERSITY SUBSYSTEM

a. Ensure that all modules are firmly seated in the card cage.

b. Check the power and alarm connections on TB1 for proper termination.

c. Ensure that the looping plugs are inserted in the jackfield.

2.6.7 FA-102 DATA TRANSMITTER

a. Ensure all modules are firmly seated in the card cage.

b. Press LAMP TEST pushbutton on each 76A1-FA Register and Indicator Tester Unit and observe that alarm lamps on all 73A1-FA Data Indicators light. Release the LAMP TEST push-button and observe that all alarm lamps extinguish.

c. Observe that the green lens confidence indicator stages light in sequence during each active scan of the alarm points and extinguish during dead scan.

2.6.8 FAULT ALARM RECEIVER SET

a. Ensure that all modules are firmly seated in the card cage.

b. When no fault information is being received, the receiver should be completely idle (no alarm lamps lighted).

2.6.9 99G2-MW COUPLING SUBSYSTEM

a. Be sure all modules are fully inserted into the shelf assembly.

b. Check the looping plugs at the jackfield to see they are all present and fully inserted.

c. If the system is already in service, check for blown fuses and see if any alarm lamps are lighted before leaving the area or proceeding to other tests.

2.6.10 90A1-MX AUDIO SERVICE CHANNEL

a. Ensure all modules are fully inserted into the subsystem card cage.

b. If the service channel is not in use, remove the headset plug from the TEL SET jacks to minimize the insertion of stray noise into the party-line audio service channel.

c. Check that terminals J and K on connector J9 of the service channel shelf are jumpered.

2.6.11 90E2-MW 1:1 IF. SWITCH SUBSYSTEMS

a. Ensure all modules are fully inserted in the card cages.

b. Check the power and alarm connections on TB1 for proper termination.

c. Ensure the looping plugs are inserted in the jackfield.

2.6.12 35A1-MW FM TRANSMITTER SUBSYSTEM

a. Check and firmly tighten all TNC connectors on the rear of the card cage.

b. Check that all modules are firmly seated in the card cage.

c. Check all screws on TB1 for tightness. (If the optional 16K1-MW Power Converter is present, it must be removed to gain access to TB1.)

d. Observe that looping plugs are installed between the jacks in the jackfield as listed below:

Between MUX TRK OUT and FMT IN, FMT OUT and MW TRK IN, 70 MC MON OUT and AFC IN, and MON and SENS IN.

2.7 ENERGIZING THE EQUIPMENT FOR THE FIRST TIME

The 55E22E-( )MW Receiver Subsystem, 53E22C-( )MW Transmitter Subsystem, 55F30A-( )MW Receiver Subsystem, 65F1A-( )MW Transmit Converter Subsystem, and the 50F11-( )MW TWT Power Amplifier Subsystem each derive their operating power from an associated power and control unit. The power and control unit converts the -48-volt primary voltage into the operating voltages required by each subsystem. Primary power is applied to a power and control unit by operating the ON/OFF switch to the ON position. A subsystem should not be energized until the Visual Inspection Procedures of paragraph 2.6 have been performed for the subsystem.

Note

The subsystem waveguide shutter should not be opened during initial equipment turn-on until after the subsystem has been aligned. Alignment procedures are outlined in the subsystem maintenance section of the commercial manual supplied with the equipment. Once energized, the ON/OFF switch should not be turned to OFF without first closing the subsystem waveguide shutter in order to prevent the radiation of spurious rf which may interfere with the receiver at a distant station.

Primary power to the 90A1-MX (MOD) Audio Service Channel is controlled by the VOLUME/ON-OFF switch located on the unit front panel. Operating voltage to the modulator and audio amplifier stages is applied when telephone headset jacks are inserted into the TEL SET jacks.

The 35A1-MW FM Transmitter Subsystem, 90C2-MW (MOD) Diversity Subsystem, 90E2-MW (MOD) IF. Switch Subsystem, 99G2-MW Coupling Subsystem, FA-102 Data Transmitter, and the Fault Alarm Receiver Set contain no ON/OFF switches and operate from the primary voltage applied to the rack. However, all modules in each subsystem receive regulated power from associated

power regulator and/or power converter units. When necessary, power may be removed from a subsystem by sliding the appropriate power regulator or power converter from the card cage far enough to disengage the connecting pins from the pin block connector. Power is restored to the subsystem when the power regulator or power converter is reseated into the card cage.

2.8 INITIAL PERFORMANCE TESTS

A series of tests designed to indicate optimum performance of each major subsystem is outlined in a separate Maintenance Standards Book assigned to each subsystem. These tests are to be performed initially on site by the contractor on the installed and operating system, and the results of these tests are recorded in ink on the reference standards summary sheet attached to the front of each Maintenance Standards Book. These tests are subsequently performed on a periodic schedule, and the results are compared with the reference standards to reveal areas of subnormal equipment performance or to detect impending failure. Refer to the appropriate Maintenance Standards Book for a detailed step-by-step outline of these performance tests.

Corrective maintenance adjustments and complex alignment procedures are covered in the subsystem maintenance sections of the commercial manuals supplied with each subsystem.

2.9 PREPARATION FOR RESHIPMENT

2.9.1 COMPLETE RACK

Preparation for reshipment is essentially the reverse of the installation procedures. The following precautions should be observed:

a. Ensure that all power is removed from the racks.

b. Disconnect only wires and cables that connect the rack to exterior equipment. Do not disconnect wires and cables that interconnect points in the same rack. Do not disconnect wires and cables interconnecting racks that are to be shipped as a single unit.

c. Avoid separating twisted pairs, thus losing their identity. If necessary, retwist and/or tape together twisted pairs.

d. Handle wires and cables carefully to avoid kinks, damage to insulation, and loss of identifying tags and labels.

e. Consolidate loose parts into an intermediate container within the shipping container to accomplish the least possible cubic displacement. Tightly package such containers to prevent movement of the contents during handling or transit. Fill voids with blocking, dunnage, or empty cartons to ensure against free movement.

f. Enclose the rack and intermediate containers in a waterproof bag with desiccant crystals to maintain a low degree of humidity within the package.

g. Pad all sharp corners and protrusions of the rack sufficiently to prevent puncture of the bag.

h. Tightly pack the rack in a shipping container that is at least 6 inches larger in each dimension than the unit to be shipped. Surround the unit with compressible cushioning material having a compression of not more than 40 percent of original thickness and reasonably free of dust. Fill voids with blocking, compressible packing material or empty cartons to ensure against movement.

2.9.2 COMPLETE SUBSYSTEMS

The subsystem is normally shipped as a part of a complete equipment rack. Shipping instructions are contained in paragraph 2.9.1. Occasionally a subsystem is replaced and the old subsystem returned to a maintenance center for extensive repairs or adjustment. Refer to table 2-1 for the size and weight of the particular subsystem to be shipped. If the subsystem is to be shipped separately, the container should be at least 6 inches larger in each dimension than the listed dimensions to provide sufficient room for cushioning materials. Normally, complete subsystem replacement is not required; instead, modules are replaced and defective modules are returned for repair.

The procedures in the following steps provide instructions for disassembly and packing for shipment of the subsystem and the modules contained within the subsystem. Make sure all power is removed from the equipment before disassembly.

a. Remove the unit to be shipped from the rack. (See paragraph 2.5.3 or 2.5.4.)

b. Place the unit in a waterproof bag with desiccant crystals added to maintain a relatively low degree of humidity within the package.

c. Pad all sharp corners and protrusions sufficiently to prevent puncture of the bag.

d. Cushion all fragile or delicate items before placement into the bag. Keep in mind the main objective is to prevent damage to the item being shipped. Cushioning material should have a compression ratio of not more than 40 percent of the original thickness and should be reasonably dust free.

e. Consolidate common or like items into an intermediate container within the shipping container to have the least possible cubic displacement. Any sturdy shipping container may be used if it is at least 6 inches larger in each dimension than the equipment to be shipped.

f. Tightly pack the contents of the shipping container. Fill voids with blocking, compressible packing material, or empty cartons to ensure against free movement during handling or transit.

2.10 STATION FLOOR PLANS, RACK LAYOUTS, AND PLOT PLANS

The equipment location floor plans and the rack layout drawings for each station are located at the end of this book. The outside plant plot plans are separately supplied in the installation drawings.

2.11 POWER REQUIREMENTS

Primary power to the equipment racks is supplied by the -48-volt dc power plant, consisting of 24 lead-calcium cells, two load-sharing battery chargers, a counter emf cell, and a low-voltage disconnect panel at each station. The battery chargers are powered by 120/240 Vac, 50 or 60 Hz., 1ϕ. In case of battery charger or ac failure, the battery bank can power the radio equipment for a minimum of 8 hours. The ac power required at each site is government-furnished with the following requirements;

120/240 Vac, 60 Hz, 1ϕ - Edzell, Mormond Hill, Thurso

120/240 Vac, 50 Hz, 1ϕ - all remaining sites

Ac power is provided by two sources. At five sites, both commercial and emergency backup power is furnished by the government. At the remaining nine sites, commercial power is government-furnished; however, emergency backup power is provided by contractor furnished engine-generators, housed in transportable shelters, which can produce 120/240 Vac, 50 Hz, 1ϕ.

The dc power requirements of each subsystem operating from the -48-volt supply are listed in table 2-5. The charger and battery capacities are listed in table 2-6. The station power requirements in terms of average and maximum dc loads, and the ac loads necessary to produce the corresponding dc loads are listed in table 2-7. Additional ac power loads, such as dehydrator, heated radomes, and tower lights, and the total ac load requirements are listed in table 2-8. It should be remembered that the average ac load indicates normal, everyday operational activity, that the maximum load indicates operation during a battery bank recharging cycle, and that the emergency load indicates operation under extreme or unusual conditions. The maximum load situation may occur when the radio equipment is operating, the battery bank is discharged after an 8-hour drainage, and all radomes, heaters, lights, dehydrators, fans, and test equipment are in full operation. It should be noted, however, that this set of operating conditions is rare. The emergency load situation may occur in case of electrical shorts or while recharging heavily discharged battery banks. The emergency load limits listed are the current loads for which the power cables, circuit breakers, etc, are designed.

The dc power distribution drawings for each station are at the back of section 5.

TABLE 2-5. POWER REQUIREMENTS OF SUBSYSTEMS

SUBSYSTEM	AMPERES	VOLTS
53E22C-( )MW Transmitter Subsystem, OT-11(V)/GRC-169(V)	3.00	-48
55E22E-( )MW Receiver Subsystem, OR-22(V)/GRC-169(V)	0.45	-48
65F1A-( )MW Transmit Converter, OU-37(V)/GRC-169(V)	1.00	-48
50F11-( )MW TWT Power Amplifier, OG-56(V)/GRC-169(V)	7.30	-48
55F30A-( )MW Receiver Subsystem, OR-22(V)/GRC-169(V)	1.50	-48
90C2-MW Diversity Subsystem, OK-80(V)/GRC-169(V)	0.85	-48
99G2-MW Coupling Subsystem, ON-57(V)/GRC-169(V)	1.8	-48
90E2-MW 1:1 IF. Switch, OK-80(V)/GRC-169(V)	0.70	-48
35A1-MW FM Transmitter, OZ-3(V)/GRC-169(V)	1.50	-48
Control Monitor Group (Fault Alarm), OK-81(V)/GRC-169(V)		
FA-102 Data Transmitter	1.80	-48
Fault Alarm Receiver Set		
FA-102 Data Receiver	1.40	-48
18D1-FA Control Panel	0.70	-48
Major Alarm and Local Indicator	0.50	-48
28A1-MW Tone Detector Units (14)	0.05	-48
90A1-MX Audio Service Channel, OW-32(V)/GRC-169(V)	0.60	-48

TABLE 2-6. BATTERY SUPPLY CAPACITIES

STATION	-48-VOLT BATTERY CHARGER CAPACITIES (AMP PER CHARGER)	-48-VOLT BATTERY BANK CAPACITY (AMP-HRS)
Thurso	50	420
Latheron	50	320
Mormond Hill	50	320
Aberdeen	50	240
Inverbervie	50	240
Kinnaber	100	980
Edzell	50	240
Craigowl Hill	50	240
East Lomond	50	240
Kirk O'Shotts	50	240
Sergeant Law	50	240
Brown Carrick	50	320
Slieveanorra	50	320
Dungiven	50	420

TABLE 2-7. STATION POWER REQUIREMENTS

STATION	AVERAGE STATION DC LOAD (AMP AT -48 VOLTS)	MAXIMUM STATION DC LOADS (AMP AT -48 VOLTS) MAX/EMER	AVERAGE STATION AC LOAD (AMP AT 120/240 VAC) FROM RF AND MUX EQUIP.	MAXIMUM STATION AC LOADS (AMP AT 120/240 VAC) MAX/EMER	AC POWER REQUIRED (KW) (RF AND MUX) AVE/MAX/EMER
Thurso	16.8	23.0/125.0	8.4	11.5/62.5	1.01/1.38/7.5
Latheron	30.7	42.0/125.0	15.3	21.0/62.5	1.83/2.50/7.5
Mormond Hill	30.7	42.0/125.0	15.3	21.0/62.5	1.83/2.50/7.5
Aberdeen	25.4	34.6/125.0	12.7	17.3/62.5	1.50/2.08/7.5
Inverbervie	25.4	34.6/125.0	12.7	17.3/62.5	1.50/2.08/7.5
Kinnaber	40.0	54.6/250.0	20.0	27.3/125.0	2.40/3.3/15.0
Edzell	16.8	23.0/125.0	8.4	11.5/62.5	1.01/1.38/7.5
Craigowl Hill	25.4	34.6/125.0	12.7	17.3/62.5	1.50/2.08/7.5
East Lomond	25.4	34.6/125.0	12.7	17.3/62.5	1.50/2.08/7.5
Kirk O'Shotts	25.4	34.6/125.0	12.7	17.3/62.5	1.50/2.08/7.5
Sergeant Law	25.4	34.6/125.0	12.7	17.3/62.5	1.50/2.08/7.5
Brown Carrick	28.8	39.4/125.0	14.4	19.7/62.5	1.73/2.40/7.5
Slieveanorra	28.8	39.4/125.0	14.4	19.7/62.5	1.73/2.40/7.5
Dungiven	28.2	38.4/125.0	14.1	19.2/62.5	1.70/2.30/7.5
Londonderry	13.9	14.0	0.5	0.5/— — —	0.06/0.06/— — —

TABLE 2-8. ADDITIONAL AC POWER LOADS

STATION	DEHYDRATOR	HEATED RADOMES	TOWER AND INSIDE LIGHTS	TEST EQUIPMENT, SHELTER HEATERS	ENG-GEN HEATERS, ENG-GEN CHARGER, VENTILATION FAN	TOTAL STATION AC LOAD REQUIREMENTS (kW) AVE/MAX/EMER
	kW AT 120/240 VAC, 1ϕ					
Thurso	0.60	3.0	—	1.2	—	5.22/6.18/ —
Latheron	0.60	11.6	0.9	4.6	1.2	20.14/21.40/26.40
Mormond Hill	0.60	12.1	0.4	1.3	0.1	15.64/16.9/21.9
Aberdeen	0.60	5.9	0.8	4.6	1.2	13.73/14.88/20.30
Inverbervie	0.60	2.8	0.9	4.6	1.2	10.63/11.78/17.20
Kinnaber	0.60	4.2	—	1.8	0.1	8.5/9.98/21.7
Edzell	0.60	1.4	0.8	4.6	0.1	7.6/8.58/14.7
Craigowl Hill	0.60	2.8	0.3	4.6	1.2	10.63/11.78/17.20
East Lomond	0.60	2.8	0.9	4.6	1.2	10.63/11.78/17.20
Kirk O'Shotts	0.60	2.8	0.4	4.6	1.2	10.63/11.78/17.20
Sergeant Law	0.60	2.8	0.9	4.6	1.2	10.63/11.78/17.20
Brown Carrick	0.60	10.4	0.4	4.6	1.2	18.44/19.67/24.80
Slieveanorra	0.60	10.4	0.9	4.6	1.2	18.44/19.67/24.80
Dungiven	—	1.4	0.9	4.6	0.1	4.41/5.61/10.80
Londonderry	—	—	—	—	—	0.05/0.05/0.05

SECTION 3

OPERATION

3.1 GENERAL OPERATION

The Ada-Beth-Cindy Microwave System consists of 14 line-of-sight links (15 stations) that provide multichannel, full-duplex communications between 4 terminal stations (Thurso, Edzell, Dungiven, and Londonderry). Eleven repeater stations complete the line-of-sight paths. One of the 14 links is an existing microwave link between Dungiven and Londonderry. With the exception of Londonderry, Dungiven, and Slieveanorra in Northern Ireland, all the stations are located in Scotland.

The highly directional properties of the antenna system used permit the use of 1- and 5-watt transmitters for line-of-sight propagation between sites. Frequency diversity operation is employed at each station to reduce disruptions in communications that might otherwise result from severe fading. In a frequency diversity system, identical intelligence is transmitted over two parallel paths at different frequencies. Since microwave signals of different frequencies tend to fade independently, there is little chance of simultaneous fading on both paths; thus, when one frequency fades, the other will usually be at or near normal strength. Under normal conditions, the outputs of the two receivers are combined to yield an overall improvement in the quality of reception. This method requires the use of duplicate "A" and "B" radio equipment, but a single antenna may be used. In addition to frequency diversity, space diversity is employed for the over-water paths between Latheron and Mormond Hill and for the paths between Brown Carrick and Slieveanorra. Interrelated fading characteristics exist over these two links and causes a quadruple diversity arrangement to be necessary at each receiving station. With space diversity, two rf signals of the same frequency are received on two antennas, separated vertically by several wavelengths. With quadruple diversity, two rf signals of different frequencies are received on two antennas, which are separated vertically by several wavelengths. This method of increasing transmission reliability takes advantage of the fact that simultaneous fading is unlikely over two separate line-of-sight paths. Fading is even more unlikely when two separate frequencies are used.

Direct communication with repeater stations is limited to the audio service channel, which provides a single-channel voice order wire on a party-line basis with all sites. A 17-point fault alarm system provides for the monitoring of equipment status at all stations by personnel at the Londonderry master terminal station. This system initiates visual and audible alarms upon the receipt of alarms from any reporting station.

3.2 FUNCTIONAL OPERATION

The following description briefly explains the functional operation of a typical microwave system that consists of a remote terminal, a repeater station, and a master terminal station. Figure 3-1 illustrates this typical system. For a detailed description of the Ada-Beth-Cindy system, refer to section 4 of this manual.

3.2.1 REMOTE TERMINAL

The numerous voice frequency circuits originating from telephone lines, tty keyers, etc., arrive at the normal-through circuit patch panel and are routed to the vf attenuator/patch bay where provisions are made for in-band signaling and line level attenuation for interface with the multiplex (carrier) equipment. The multiplex equipment divides the incoming vf circuits into 12-channel groups, each channel occupying a separate 4-kHz slot in the group spectrum. Further frequency translation makes it possible to combine up to five 12-channel groups on a common line for a 60-channel system. This composite signal is the 312- to 552-kHz and 564- to 804-kHz baseband line frequency signal that is routed to the coupling subsystem. The coupling subsystem applies preemphasis, and level and impedance matching before applying the baseband signal to the transmitter subsystems. Transmitter subsystems A and B are arranged for frequency diversity operation. Each remodulating transmitter subsystem uses the message baseband to directly modulate the klystron for transmission. Order-wire and fault alarm data (which occupy a 300-Hz to 10-kHz slot) are applied to a separate modulating input and are transmitted along with the message baseband. Note that the audio service channel

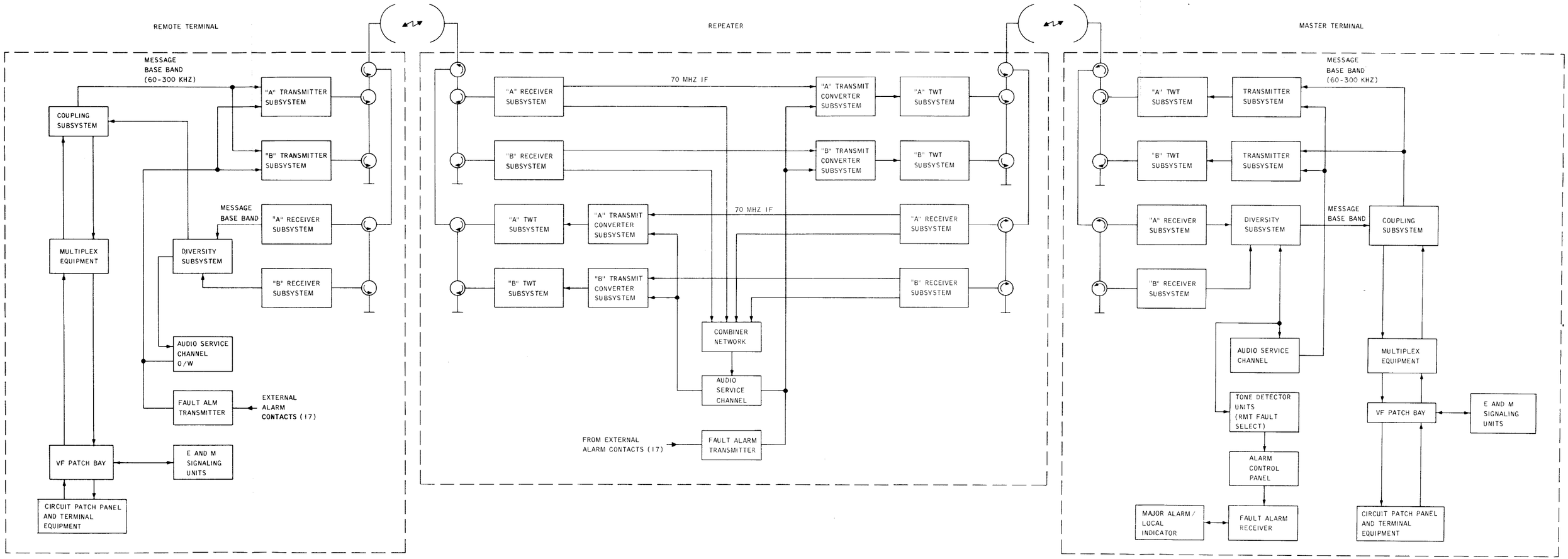

Figure 3-1. Typical Microwave System Block Diagram

operates independently of the multiplex equipment and is used as an interstation party line for maintenance personnel and for transmitting the alarm status of the station to the master terminal station.

3.2.2 REPEATER STATION

In frequency diversity operation, microwave signals from the distant A and B transmitters are received by a single antenna and coupled to the A and B receivers, which are arranged in a dual diversity configuration. Each receiver has a preselector filter at its input so only the signal for which the filter is tuned is selected. Each receiver heterodynes the microwave signal down to a 70-MHz if. for application to the associated transmit converter subsystem. The demodulated message baseband signal is available at auxiliary receiver outputs for routing to the audio service channel. The service channel selects information on the 300-Hz to 3-kHz band for voice order-wire communications. The 70-MHz if. signals applied to the transmit converters are heterodyned back up into the microwave frequency range and fed to the associated 5-watt twt power amplifier. The twt subsystem amplifies this signal and couples it to the transmit waveguide and antenna. Order-wire and fault alarm data are applied to the transmit converter as separate modulating inputs and are transmitted along with the message baseband to the master terminal station.

3.2.3 MASTER TERMINAL

The master terminal station is so designated because it serves as the monitoring point for the fault status of all stations in the system. The received A and B microwave signals are selectively applied to the A and B receivers, respectively, where the signals are demodulated to the baseband level. From the receivers, the signals are coupled to the diversity subsystem, which combines the two baseband signals according to their relative signal-to-noise ratios. The resultant baseband output is routed to the coupling subsystem and to the audio service channel. The coupling subsystem provides deemphasis, and level and impedance matching for interface with the multiplex equipment. The multiplex equipment demodulates the message baseband to provide up to 60 parallel voice-frequency channels. Channel information is then cabled to the vf attenuator/patch bay and on to the circuit patch panel and terminal equipment. The audio service channel selects the order-wire and fault alarm data in the 300-Hz to 12-kHz band. The fault alarm data, consisting of individual channels of fault information for each reporting station, is applied to the tone detector units that selectively demodulate the received data. A visual indication for the reception of an actual fault from a remote station is provided on the alarm control panel. The remote station reporting the fault is selected at the alarm control panel and the exact nature of the fault is indicated on the fault alarm receiver. The major alarm/local indicator has provisions for displaying visual alarms and activating both visual and audible alarms at the station alarm panel.

3.3 PREPARATION FOR USE

After the equipment is installed and aligned, operation is continuous and no special preparation for use is necessary.

3.4 CONTROLS AND INDICATORS

An index of tables for the controls and indicators of the various major equipments is contained in table 3-1. Refer to this table to easily locate the applicable table of any specific major equipment.

Note

The equipment supplied operates continuously and does not require a radio operator to establish communications. Therefore, the controls and indicators listed in the following tables should be operated only by qualified maintenance personnel.

TABLE 3-1. INDEX OF CONTROL AND INDICATOR TABLES

TABLE	TYPE NUMBER	MAJOR EQUIPMENT NAME
3-2	55E22E-( )MW	Receiver subsystem
3-3	53E22C-( )MW	Transmitter subsystem
3-4	55F30A-( )MW	Receiver subsystem
3-5	65F1A-( )MW	Transmit converter subsystem
3-6	50F11-( )MW	Twt power amplifier subsystem
3-7	35A1-MW	Fm transmitter subsystem
3-8	90E2-MW (MOD)	If. switch subsystem
3-9	90C2-MW (MOD)	Diversity subsystem
3-10	99G2-MW	Coupling subsystem
3-11	90A1-MX	Audio service channel
3-12	FA-102	Fault alarm receiver set
3-13	FA-102	Data Transmitter
3-14		Antenna set

3.5 OPERATING PROCEDURES

After the equipment is installed and aligned, operation is continuous and no operating procedures are necessary. Standard procedures for starting, stopping, and emergency operation are contained in table 3-15.

CAUTION

Unless otherwise directed, only qualified maintenance personnel should perform the procedures given in table 3-15. Unqualified personnel may cause the system to fail or damage the equipment by indiscriminate operation of the controls.

3.6 TUNING ADJUSTMENTS

No operational tuning adjustments are necessary to the equipment.

3.7 SUMMARY OF OPERATING PROCEDURES

Complete starting, stopping, and emergency procedures are contained in table 3-15.

3.8 OPERATOR MAINTENANCE

Maintenance by a radio operator is limited to periodic inspection and cleaning of the equipment as directed. This limitation is due to the complexity of the equipment and the qualifications necessary to maintain the equipment.

Preventive maintenance procedures are contained in the Maintenance Standards books and in the Planned Maintenance Subsystem (PMS) data supplied for the major equipment in the system. Refer to section 5 for a brief description of the PMS.

3.9 EMERGENCY MAINTENANCE

The following instructions may be used at the system level when there is a partial failure or malfunction of components within the system.

3.9.1 CRITICAL COMMUNICATION LINKS

Redundant and standby techniques are employed throughout the system, so that failure of any one unit critical to signal transmission does not disable the system. Each station within an extremely critical communication link should contain a complete set of spare modules that have been previously aligned in the operating subsystem and are ready for immediate substitution. Thus, with the aid of the fault alarm system provided, a defective module can be located and replaced in a matter of seconds. In less critical links, a set of spare modules for the microwave system permits substitution of a spare module, but the module must be aligned with the subsystem after substitution in accordance with the alignment procedures specified in the applicable commercial manual.

3.9.2 NONCRITICAL COMMUNICATION LINKS

Where a set of spare modules is not maintained, temporary emergency measures may be required. A remote possibility exists that a unit critical to signal transmission might fail and, before a replacement could be obtained or repairs made, a unit in the remaining signal path might fail, resulting in loss of signal in that path direction. Maintenance personnel with a thorough knowledge of the system and station, and after judicious use of station layout, signal flow, power distribution, and alarm distribution drawings, may be able to restore a signal path by one of the emergency procedures given below.

3.9.2.1 FAILURE OF UNLIKE UNITS IN SAME SIGNAL FLOW DIRECTION

Failure of a major equipment subsystem and the redundant counterpart in the same signal flow direction will result in a complete loss of signals. If failure of each subsystem has been caused by failure of different major units, the faulty unit in one subsystem can be replaced with the like good unit from the other subsystem. For example, transmitter A fails because of failure of the 27E8-MW modulator and transmitter B in the same signal flow direction fails because of failure of the 23H2-MW afc unit. To restore communications, replace the faulty 27E8-MW in transmitter A with the good 27E8-MW modulator from transmitter B. The units are plug-in modules and interchange of units is easily accomplished. This method of emergency maintenance can be used at all stations. Redundancy of operation has not been restored and all faulty units must be repaired or replaced with good units as soon as possible.

3.9.2.2 FAILURE OF LIKE UNITS IN SAME SIGNAL FLOW DIRECTION

Failure of a major equipment subsystem and the redundant counterpart in the same signal flow direction can be caused by failure of the same major unit within each subsystem and will cause complete loss of signals. To restore communications, replace one of the faulty units with a like good unit used in the opposite signal flow direction. For example, the 27E8-MW modulators in transmitters A and B in one signal flow direction fail. To restore communications, replace the faulty 27E8-MW in either transmitter A or B with one of the two good modulators working in the opposite signal flow direction. This method of emergency maintenance can be used at all repeater stations. Redundancy in both signal flow directions is reduced and all faulty units must be repaired or replaced as soon as possible.

TABLE 3-2. 55E22E-( )MW RECEIVER SUBSYSTEM CONTROLS AND INDICATORS (FIGURE 3-2)

INDEX	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS		
1	PERFORMANCE MONITOR meter	Monitors subsystem voltage and signal levels	Receiver power and control unit	Indication determined by switch position
	V IN	Primary input voltage (-48 volts)	Receiver power and control unit — PERFORMANCE MONITOR meter	In red
	V OUT	Regulated -20-volt output	Receiver power and control unit — PERFORMANCE MONITOR meter	40 ±1
	LO DRIVE	Local oscillator injection level	Receiver power and control unit — PERFORMANCE MONITOR meter	In red
	AGC NORMAL	Indicates relative received signal level	Receiver power and control unit — PERFORMANCE MONITOR meter	Recorded initially at installation
	AGC LOW	Same as AGC NORMAL on a more sensitive scale	Receiver power and control unit — PERFORMANCE MONITOR meter	Recorded initially at installation
	LIM LEVEL	Indicates level of if. signal into limiter	Receiver power and control unit — PERFORMANCE MONITOR meter	Recorded initially at installation
	DISC	Indicates frequency error in received signal	Receiver power and control unit — PERFORMANCE MONITOR meter	Null (zero)

TABLE 3-2. (Continued)

INDEX	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS (Cont)		
2	IF AMPLIFIER panel meter	Monitors if. amplifier voltage and signal levels	If. amplifier	Indication determined by switch position
	LIMITER DRIVE	If. signal voltage at input to limiter stage	If. amplifier — panel meter	Recorded initially at installation
	SIGNAL STRENGTH			
	NORMAL	Agc voltage applied to the agc amplifier	If. amplifier — panel meter	Recorded initially at installation
	EXPANDED	Same as above on a more sensitive scale	If. amplifier — panel meter	Recorded initially at installation
	DISCRIMINATOR	Error in received signal frequency with respect to if. center frequency (70 MHz)	If. amplifier — panel meter	Null (zero)
	IF. CURRENT	Current drain on power supply by entire if. amplifier unit	If. amplifier — panel meter	Recorded initially at installation
3	SUBSYSTEM ALARM	Fuses in power and control unit	Lower left-hand corner of subsystem	OFF
4	ON/OFF	Turns primary power on and off	Receiver power and control unit	ON
5	-20V ADJ	Adjusts the level of the regulated -20-volt output	Receiver power and control unit	Set for an indication of 39 on PERFORMANCE MONITOR meter
6	SHUTTER	When closed, isolates the receiver from the mainline waveguide	Waveguide assembly below subsystem jackfield	OPEN

TABLE 3-3. 53E22C-( )MW TRANSMITTER SUBSYSTEM CONTROL AND INDICATORS (FIGURE 3-3)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS		
1	PERFORMANCE MONITOR meter	Monitors subsystem voltage, current, and signal levels	Klystron power and control unit	Indication determined by switch position
	PWR MON	Transmitter relative rf power	Klystron power and control unit — PERFORMANCE MONITOR meter	In red
	70 MC	If. signal level into the afc unit	Klystron power and control unit — PERFORMANCE MONITOR meter	In red
	MIXER I	Afc mixer crystal current	Klystron power and control unit — PERFORMANCE MONITOR meter	In red
	SRD BIAS	Bias current in the step-recovery diode	Klystron power and control unit — PERFORMANCE MONITOR meter	Recorded initially at installation
	SRD DRIVE	Rf power from the reference oscillator applied to the step-recovery diode	Klystron power and control unit — PERFORMANCE MONITOR meter	Recorded initially at installation
	-20V	Output voltage from the -20-volt supply	Klystron power and control unit — PERFORMANCE MONITOR meter	In red

TABLE 3-3. (Continued)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS (Cont)		
	MOD V	Output voltage from the +60-volt supply	Klystron power and control unit — PERFORMANCE MONITOR meter	In red
	CATH V	Output voltage from the -750-volt supply	Klystron power and control unit — PERFORMANCE MONITOR meter	In red
	RPLR	Klystron repeller voltage	Klystron power and control unit — PERFORMANCE MONITOR meter	Recorded initially at installation
	KLY I	Klystron beam current	Klystron power and control unit — PERFORMANCE MONITOR meter	Recorded initially at installation
2	AFC DISC	Transmitter frequency error	Klystron power and control unit — AFC DISC meter	Null (zero)
3	RF PWR/FREQ ALARM	Initiated by low klystron rf output or off frequency condition	Klystron power and control unit	OFF
4	Sight glass	Ebullator coolant level	Left side of subsystem housing	Level comes up to center-line of upper sight glass

TABLE 3-3. (Continued)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS (Cont)		
5	SUBSYSTEM ALARM	Initiated by blown fuses, AFC switch in the OFF position, mode centering switch out of NORMAL position, POWER switch in the PULL OFF position, an RF PWR/FREQ ALARM, or low coolant level	Left side of subsystem housing	OFF
		CONTROLS		
6	POWER			
	PUSH ON	Applies primary power	Klystron power and control unit	PUSH ON
	PULL OFF	Removes primary power	Klystron power and control unit	
7	OFF-LOW-NORMAL-HIGH	Klystron mode centering switch	Klystron power and control unit	NORMAL
8	AFC ON-OFF	In the OFF position, the afc voltage is removed from the repeller supply	Klystron power and control unit	ON
9	Shutter OPEN/CLOSED	When closed, isolates the transmitter from the main-line waveguide	Transmitter waveguide assembly	OPEN

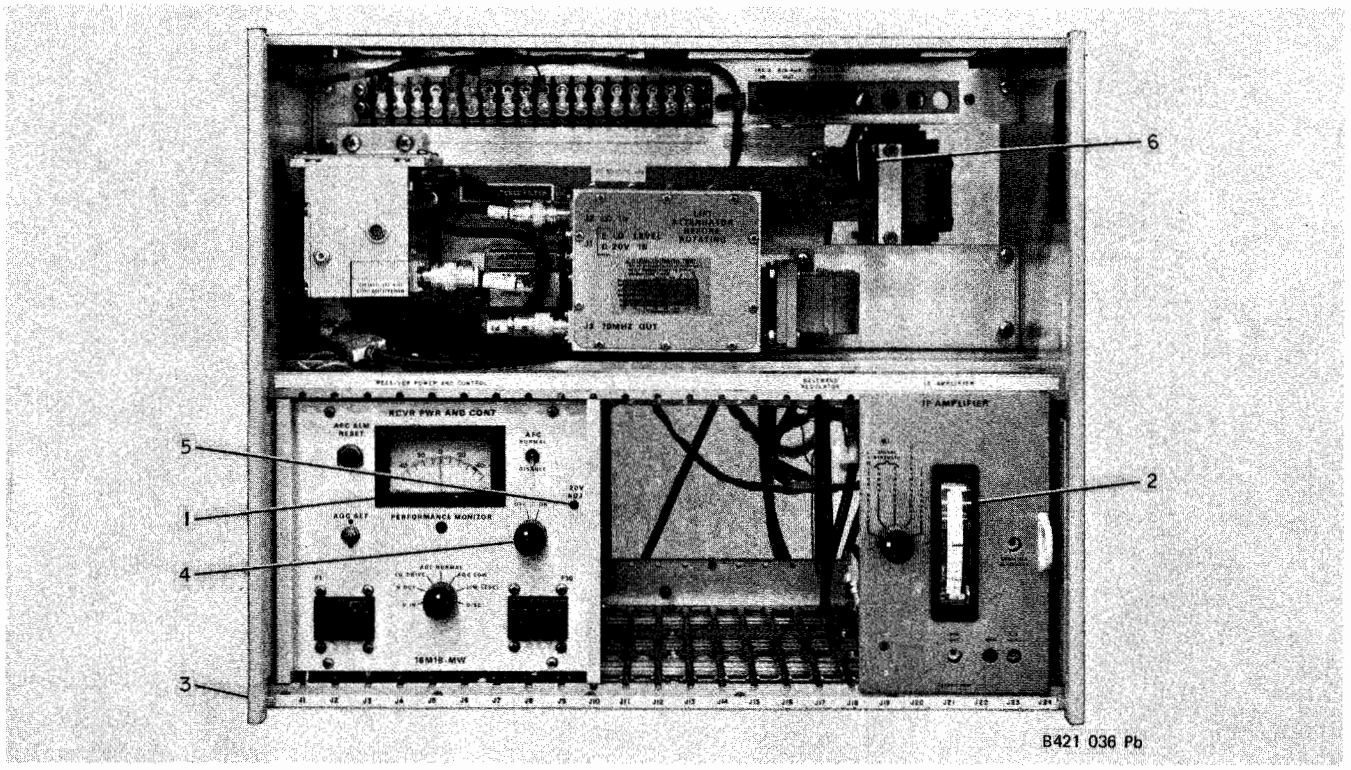

Figure 3-2. 55E22E-( )MW Receiver Subsystem

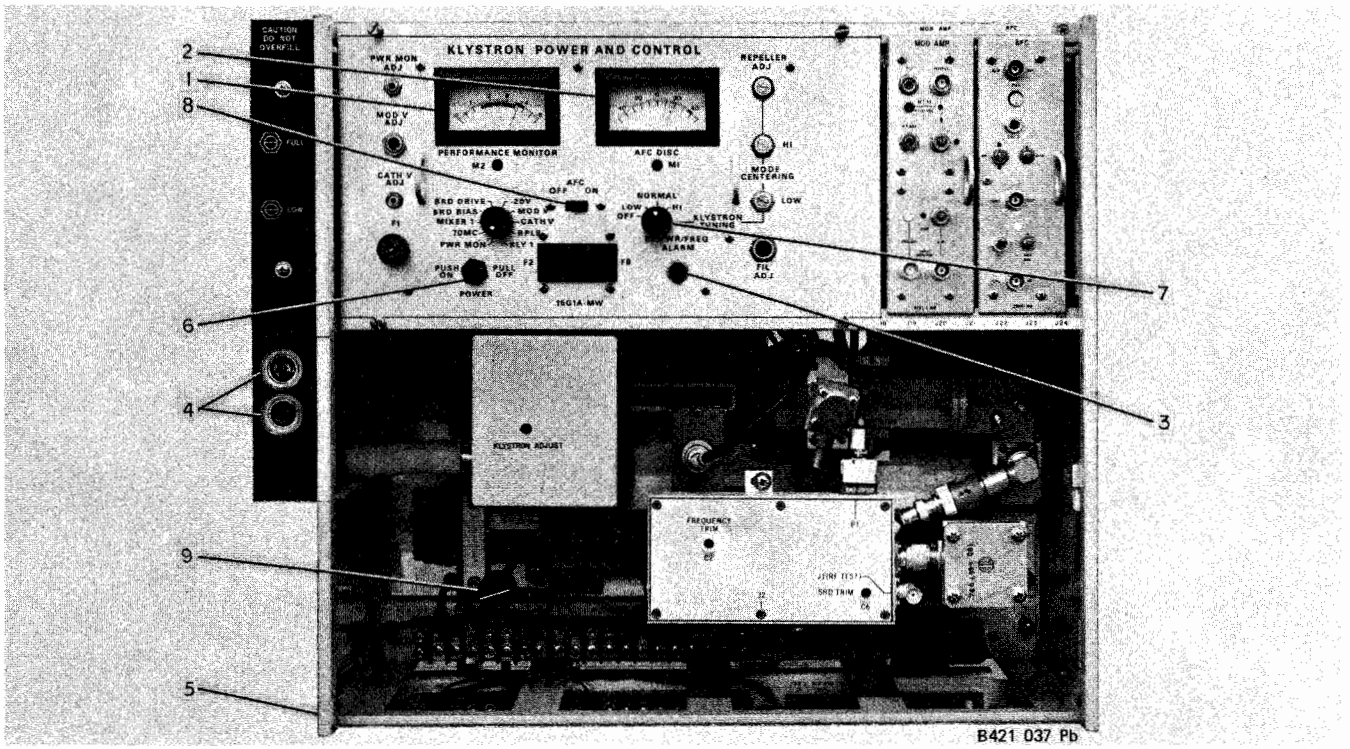

Figure 3-3. 53E22C-( )MW Transmitter Subsystem

TABLE 3-4. 55F30A-( )MW RECEIVER SUBSYSTEM CONTROLS AND INDICATORS (FIGURE 3-4)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS		
1	PERFORMANCE MONITOR meter	Monitors subsystem voltage and signal levels	Receiver power and control unit	Indication determined by switch setting
	V IN	Primary input voltage (-48 volts)	Receiver power and control unit — PERFORMANCE MONITOR meter	In red
	V OUT	Regulated -20-volt output	Receiver power and control unit — PERFORMANCE MONITOR meter	In red
	LO DRIVE	Local oscillator injection level	Receiver power and control unit — PERFORMANCE MONITOR meter	In red
	AGC NORMAL	Indicates relative received signal level	Receiver power and control unit — PERFORMANCE MONITOR meter	Recorded initially at installation
	AGC LOW	Same as AGC NORMAL on a more sensitive scale	Receiver power and control unit — PERFORMANCE MONITOR meter	Recorded initially at installation
	LIM LEVEL	Indicates level of if. signal into limiter	Receiver power and control unit — PERFORMANCE MONITOR meter	Recorded initially at installation

TABLE 3-4. (Continued)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS (Cont)		
	DISC	Indicates frequency error in received signal	Receiver power and control unit — PERFORMANCE MONITOR meter	Null (zero)
2	SHUTTER CLOSED	When lighted, indicates that the waveguide shutter is closed	Subsystem jackfield	OFF
3	LO OFF FREQ	When lighted, indicates an extended period of search signal	Subsystem jackfield	OFF
4	FUSE ALARM	When lighted, indicates a blown fuse	Subsystem jackfield	OFF
5	CARRIER ALARM	When lighted, indicates an abnormally low agc voltage	70-MHz quieting oscillator	OFF
6	SUBSYSTEM ALARM	Initiated by any one of the above alarms	Left side of subsystem assembly	OFF
		CONTROLS		
7	ON/OFF	Turns primary power on and off	Receiver power and control unit	ON
8	-20V ADJ	Adjusts the -20-volt supply output	Receiver power and control unit	Set for a reading of 39 on the PERFORMANCE MONITOR meter
9	AGC SET	Calibrates the AGC NORMAL scale on the PERFORMANCE MONITOR meter	Receiver power and control unit	Set for an indication in red on the AGC NORMAL scale at installation

TABLE 3-4. (Continued)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		CONTROLS (Cont)		
9	SHUTTER	When closed, isolates the receiver from the mainline waveguide	Receiver waveguide assembly	OPEN

TABLE 3-5. 65F1A-( )MW TRANSMIT CONVERTER SUBSYSTEM CONTROLS AND INDICATORS (FIGURE 3-5)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS		
1	PERFORMANCE MONITOR meter	Monitors subsystem voltage and signal levels	Transmit power and control unit	Indication determined by switch setting
	V IN	Primary input voltage (-48 volts)	Transmit power and control unit — PERFORMANCE MONITOR meter	In red
	V OUT	Regulated -20-volt supply output	Transmit power and control unit — PERFORMANCE MONITOR meter	In red
	DR LEVEL	Signal level from the transmit local oscillator	Transmit power and control unit — PERFORMANCE MONITOR meter	In red

TABLE 3-5. (Continued)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS (Cont)		
	1 BIAS	Bias level on CR1 in the balanced modulator	Transmit power and control unit — PERFORMANCE MONITOR meter	Recorded initially at installation
	2 BIAS	Bias level on CR2 in the balanced modulator	Transmit power and control unit — PERFORMANCE MONITOR meter	Recorded initially at installation
2	LO OFF FREQ	When lighted, indicates prolonged period of afc search	Subsystem jackfield	OFF
3	FUSE ALARM	When lighted, indicates a blown fuse in the power and control unit	Subsystem jackfield	OFF
4	SUBSYSTEM ALARM	Initiated by any one of above alarms	Left side of subsystem cabinet	OFF
5	ON-OFF	Turns the primary power on and off	Transmit power and control unit	ON
6	-20V ADJ	Adjusts the -20-volt output	Transmit power and control unit	Set for an indication of 39 on the PERFORMANCE MONITOR meter
7	AFC ALARM RESET	Resets the sensing circuits in the off-frequency alarm unit	Transmit power and control unit	
8	AFC NORMAL/DISABLE	Disables the afc circuit for adjustments and repairs	Transmit power and control unit	NORMAL

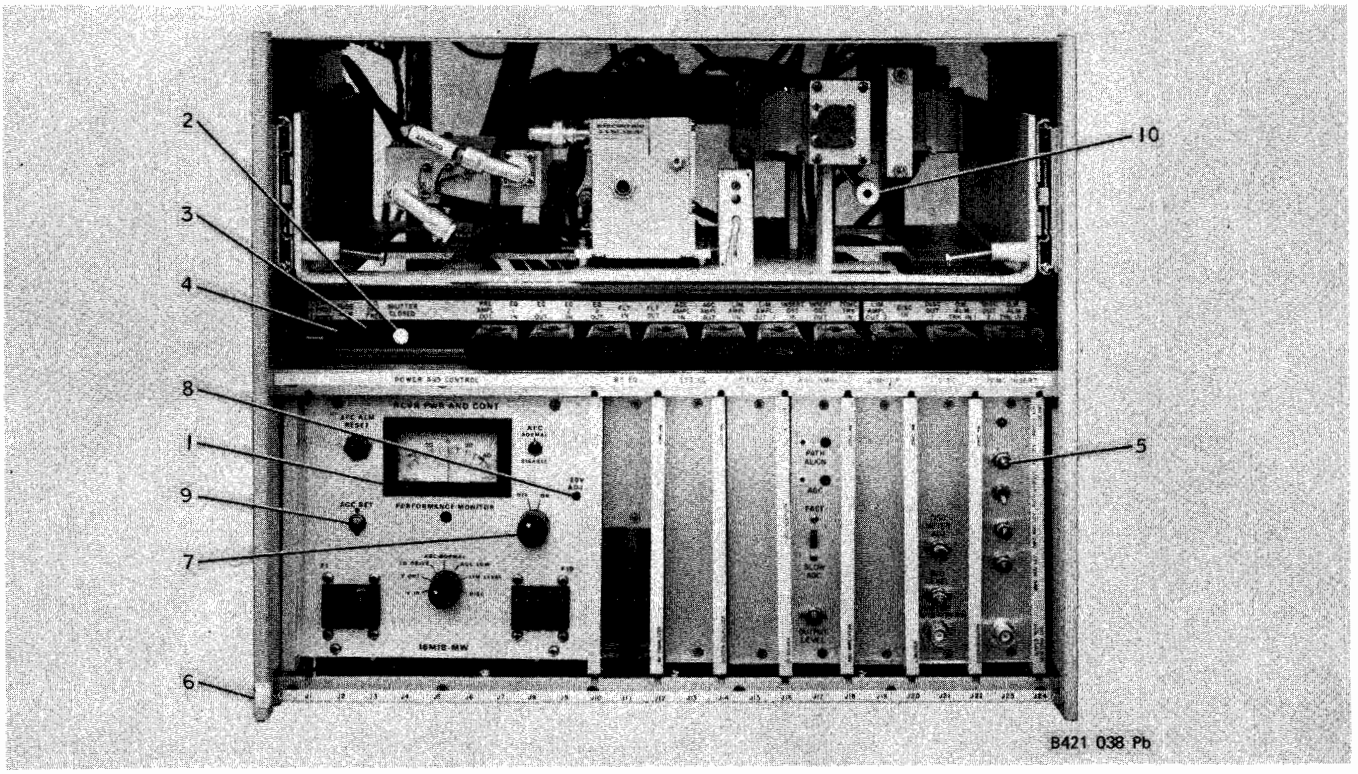

Figure 3-4. 55F30A-( )MW Receiver Subsystem

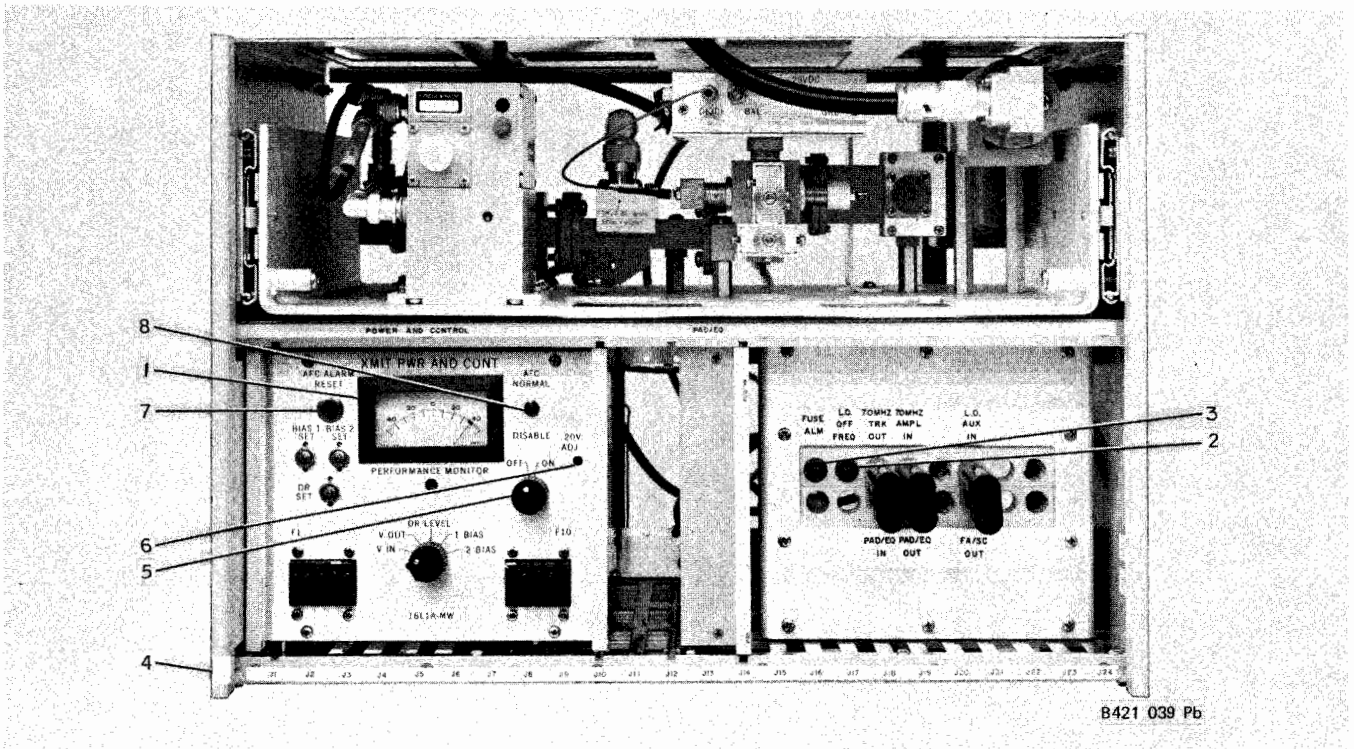

Figure 3-5. 65F1A-( )MW Transmit Converter Subsystem

TABLE 3-6. 50F11-( )MW TWT POWER AMPLIFIER SUBSYSTEM CONTROLS AND INDICATORS (FIGURE 3-6)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS		
1	HELIX VOLTAGE	Twt helix potential	Twt power supply	3100 to 3500 volts
2	HELIX CURRENT	Twt helix current	Twt power supply	Less than 0.6 mA
3	CATHODE CURRENT	Twt cathode current	Twt power supply	45 ±1 mA
4	POWER ON lamp	Power ON/OFF switch	Twt power supply	Lighted
5	OVERLOAD ALARM lamp	Activated by excessive helix current or by turning off the helix and anode voltages or by pressing the STANDBY button	Twt power supply	Extinguished
6	-24/48 VDC	Indicates primary input voltage	Monitor unit	In red
	TWT PWR	Indicates twt rf output power	Monitor unit	In red
7	SHUTTER CLOSED lamp	Waveguide shutter switch	Monitor unit	Extinguished
		CONTROLS		
8	ON/OFF	Controls primary power to the twt power supply	Twt power supply	ON
9	STANDBY	Remove the helix and anode voltages from the twt	Twt power supply	Disengaged
10	BURN-IN/TUNE/OPERATE	Controls twt supply voltages	Twt power supply	OPERATE

TABLE 3-6. (Continued)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		CONTROLS (Cont)		
11	RESET	Restores the helix and anode voltages after they have been removed, either by the helix overload circuit or by the STANDBY button	Twt power supply	
12	-24/48 VDC/TWT PWR	Connects the meter to the subsystem primary input voltage or to an rf power detector at the subsystem output	Monitor unit	TWT PWR
13	Waveguide shutter OPEN/ CLOSED	Isolates the twt output from the mainline waveguide when CLOSED	Transmit waveguide assembly	OPEN

TABLE 3-7. 35A1-MW FM TRANSMITTER SUBSYSTEM CONTROLS AND INDICATORS (FIGURE 3-7)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS		
1	AFC FAIL	Initiated when the fm generator output level drops sufficiently or drifts off frequency	Subsystem jackfield	Extinguished
2	B/B PLT	(Optional) Initiated when the level of the system pilot drops below a preset level	Subsystem jackfield	Extinguished
3	FM GEN FAIL	Initiated when the output of the fm generator decreases by 3 dB	Subsystem jackfield	Extinguished
4	FUSE OR POWER	Initiated by a blown fuse in the power regulator	Subsystem jackfield	Extinguished
5	ACO	Initiated when the ACO KEY (alarm cutoff) is operated to cut off the external alarm circuit	Subsystem jackfield	Extinguished
6	SUBSYSTEM ALARM	Initiated by the activation of any of the above alarms	Lower left side of the subsystem cabinet	Extinguished
		CONTROLS		
7	ACO KEY	Disables external fmt alarms for subsystem test and adjustment	Subsystem jackfield	Horizontal

TABLE 3-7. (Continued)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		CONTROLS (Cont)		
8	AFC ON-OFF	When off, disables the afc circuit for test and alignment	Fm generator unit	ON
9	ALARM TEST	When depressed, simulates a 3-dB drop in the fm generator output level	Fm generator unit	Disengaged

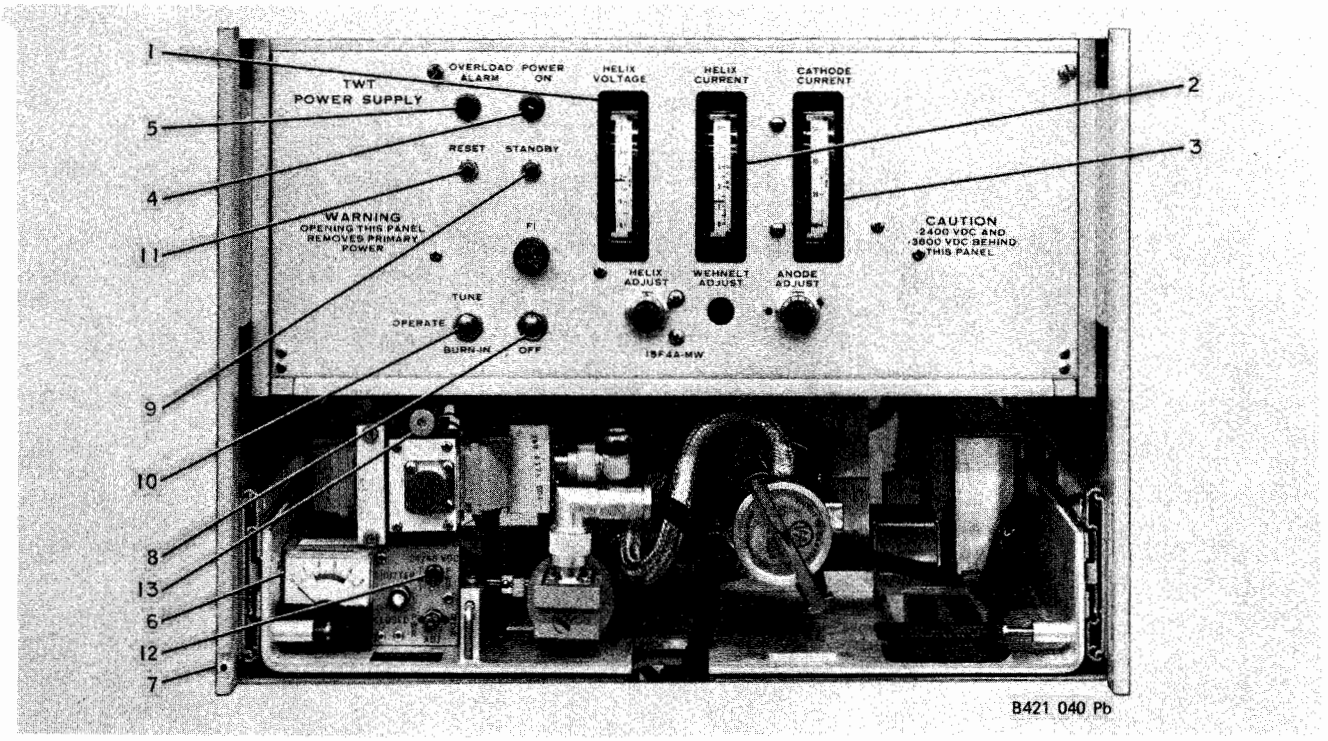

Figure 3-6. 50F11-( )MW TWT Power Amplifier Subsystem

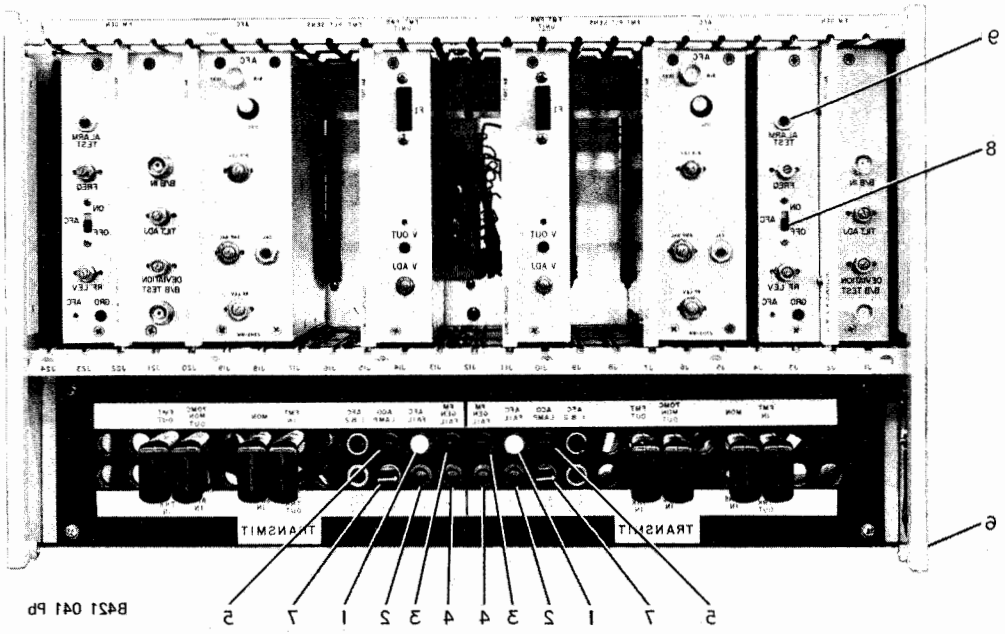

Figure 3-7. 35A1-MW FM Transmitter Subsystem

TABLE 3-8. 90E2-MW(MOD) IF. SWITCH SUBSYSTEM CONTROLS AND INDICATORS (FIGURE 3-8)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS		
1	A P	A-channel continuity pilot level	Control unit panel meter	0 dB
	A C	A-channel comparator control voltage	Control unit panel meter	Recorded initially at installation
	B PILOT	B-channel continuity pilot level	Control unit panel meter	0 dB
	B CCV	B-channel comparator control voltage	Control unit panel meter	Recorded initially at installation
2	A PATH ALARM:			
	PILOT	Initiated by loss of A-channel continuity pilot	Control unit	Extinguished
	NOISE	Initiated by excessive noise in A-channel	Control unit	Extinguished
	IN SERVICE	When lighted, indicates that the A-channel is in use	Control unit	
3	B PATH ALARM:			
	PILOT	Initiated by loss of B-channel continuity pilot	Control unit	Extinguished
	NOISE	Initiated by excessive noise in the B-channel	Control unit	Extinguished
	IN SERVICE	When lighted, indicates that the B-channel is in use	Control unit	
4	ALARM	Indicates a 4-dB, or more, drop in pilot oscillator level	A (or B) pilot oscillator unit (optional unit)	Extinguished

TABLE 3-8. (Continued)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS (Cont)		
5	IN SERVICE	When lighted, indicates that the A (or B) pilot oscillator is on line	A (or B) pilot oscillator unit (optional unit)	
		CONTROLS		
6	METER SELECT	Selects a pilot voltage or ccv to be monitored on the panel meter	Control unit	OFF
7	NORMAL/DISABLE	Disables either the A or B channel for test and maintenance	Control unit	NORMAL
8	CALIBRATE SELECT	Simulates noise on the channel selected	Control unit	OFF
9	TEST	Attenuates the simulated noise by a preset amount for test and alignment	Control unit	Disengaged
10	CLAMP/RELEASE	When in the RELEASE position, removes the ccv clamping voltage and lights the subsystem alarm lamp	Comparator unit	CLAMP
11	TEST	Attenuates the oscillator output by a preset amount for test and alignment	Pilot oscillator unit (optional unit)	Disengaged

TABLE 3-8. (Continued)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		CONTROLS (Cont)		
12	PILOT OFF	When depressed, removes the pilot and noise output from the converter	Pilot converter	Disengaged
13	TEST	Attenuates the pilot level by 6 dB for test and alignment	Pilot converter	Disengaged

TABLE 3-9. 90C2-MW(MOD) DIVERSITY SUBSYSTEM CONTROLS AND INDICATORS (FIGURE 3-9)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS		
1	A P	A-channel continuity pilot level	Control unit panel meter	0 dB
	A C	A-channel combiner control voltage	Control unit panel meter	Recorded initially at installation
	B PILOT	B-channel continuity pilot level	Control unit panel meter	0 dB
	B CCV	B-channel combiner control voltage	Control unit panel meter	Recorded initially at installation
2	A PATH ALARM:			
	PILOT	Initiated by loss of A-channel continuity pilot	Control unit	Extinguished
	NOISE	Initiated by excessive noise in A-channel	Control unit	Extinguished
	COMBINER	Initiated by malfunction of A combiner	Control unit	Extinguished
3	B PATH ALARM:			
	PILOT	Initiated by loss of B-channel continuity pilot	Control unit	Extinguished
	NOISE	Initiated by excessive noise in the B-channel	Control unit	Extinguished
	COMBINER	Initiated by malfunction of B combiner	Control unit	Extinguished
4	ALARM	Indicates a 4-dB, or more, drop in pilot oscillator level	Pilot oscillator unit	Extinguished

TABLE 3-9. (Continued)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS (Cont)		
5	IN SERVICE	Oscillator output level	Pilot oscillator unit	In single unit operation, lamp is always lighted
6	SQUELCH DISABLE	Indicates when the SQUELCH NORMAL/ DISABLE switch is in SQUELCH DISABLE position	Alarm unit	Extinguished
7	A PATH ALARM	Indicates a failure (pilot loss or excessive noise) in the A-channel	Alarm unit	Extinguished
8	B PATH ALARM	Indicates a failure (pilot loss or excessive noise) in the B-channel	Alarm unit	Extinguished
9	ALARM	Fuse, F1	Power regulator unit	Extinguished
10	SUBSYSTEM ALARM	Initiated by any of the above alarms	Lower left-hand corner	Extinguished
		CONTROLS		
11	METER SELECT	Selects a pilot voltage or ccv to be monitored on the panel meter	Control unit	OFF
12	NORMAL/DISABLE	Disables either the A or B channel for test and maintenance	Control unit	NORMAL
13	CALIBRATE SELECT	Simulates noise on the channel selected	Control unit	OFF

TABLE 3-9. (Continued)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		CONTROLS (Cont)		
14	TEST	When pressed, attenuates the the noise by a preset amount for test and alignment	Control unit	Disengaged
15	PILOT OFF	When pressed, removes the output of the converter	Pilot converter unit	Disengaged
16	TEST	When pressed, drops the pilot level by 6 dB for test and alignment	Pilot converter unit	Disengaged
17	SQUELCH NORMAL/ SQUELCH DISABLE	When in the SQUELCH DISABLE position, disables the squelch function of the combiners so that the control unit may be removed without squelching both paths	Alarm unit	SQUELCH NORMAL
18	TEST	When pressed, attenuates the oscillator signal by 4 dB for test and alignment	Pilot oscillator unit	Disengaged

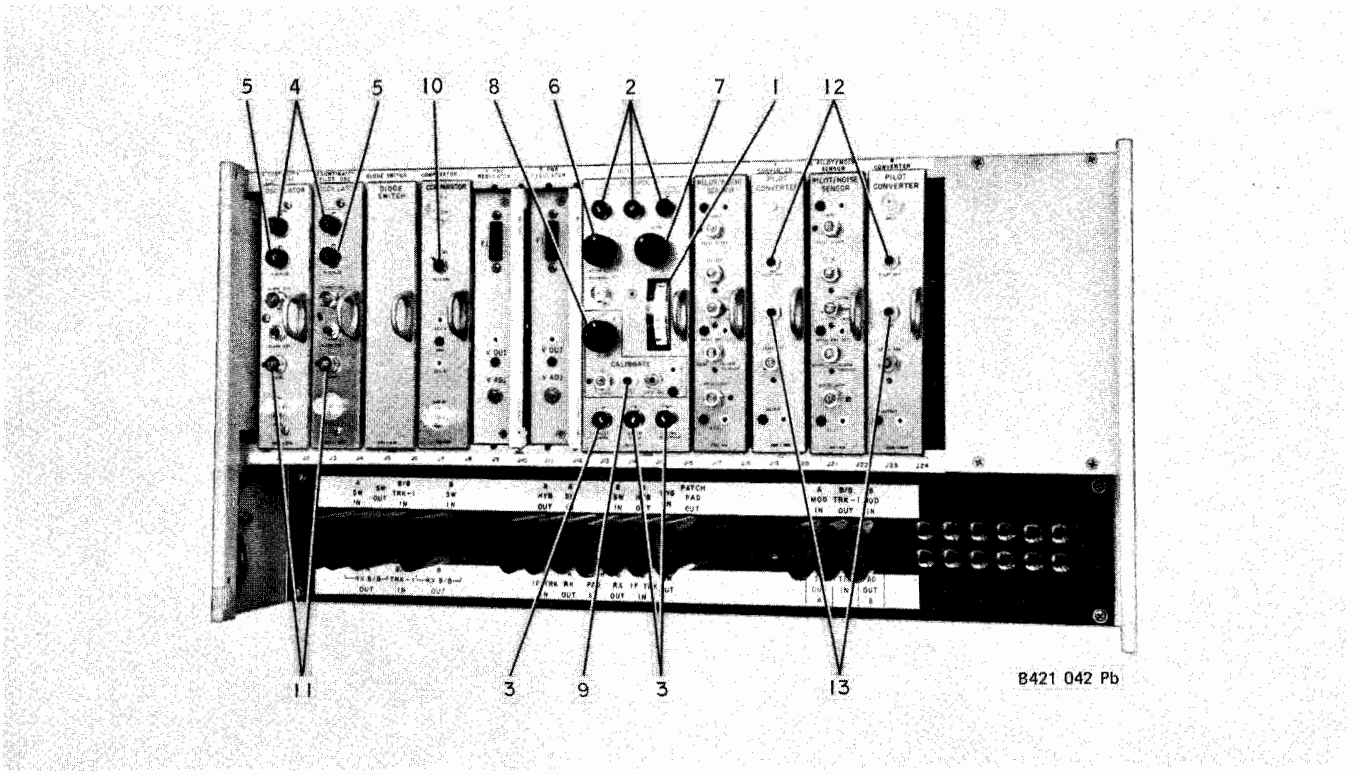

Figure 3-8. 90E2-MW (MOD) 1:1 IF. Switch Subsystem

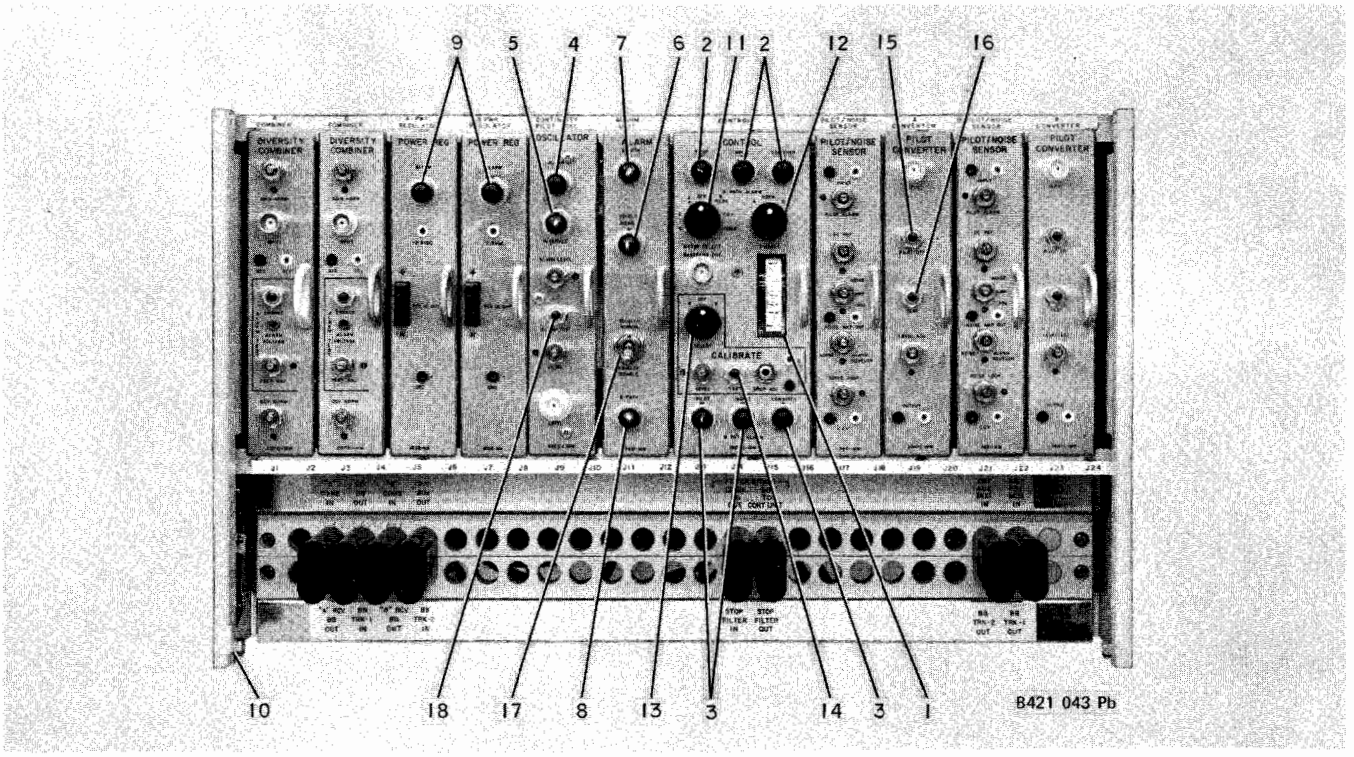

Figure 3-9. 90C2-MW (MOD) Diversity Subsystem

TABLE 3-10. 99G2-MW COUPLING SUBSYSTEM CONTROLS AND INDICATORS (FIGURE 3-10)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS		
1	ALARM	Fuses, F1, F2, and F3	Power regulator unit	Extinguished
2	ALARM	Any significant component failure	Baseband amplifier	Extinguished
3	SUBSYSTEM ALARM	Initiated by any of the above alarms	Lower left-hand corner of subsystem jackfield	Extinguished
		CONTROLS		
	No operator level controls on this subsystem			

TABLE 3-11. 90A1-MX AUDIO SERVICE CHANNEL CONTROLS AND INDICATORS (FIGURE 3-11)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS		
1	POWER lamp	Indicates primary power applied to equipment	Unit front panel	Lighted
2	OVEN lamp	Indicates crystal oven on (used on hf service channel only)	Unit front panel	Extinguished (Not used on audio service channel)
		CONTROLS		
3	VOLUME/ON-OFF	Controls primary power to the unit and adjusts the level into the audio amplifiers	Unit front panel	ON
4	SIDETONE	Adjusts the audio level applied to an extension telephone set	Unit front panel	Set for a comfortable listening level
5	CALL SIG	When pressed, a signaling tone is transmitted	Unit front panel	
6	TEL SET	Operating voltages are applied to the sidetone amplifier and modulator unit when a headset plug is inserted into these jacks	Unit front panel	

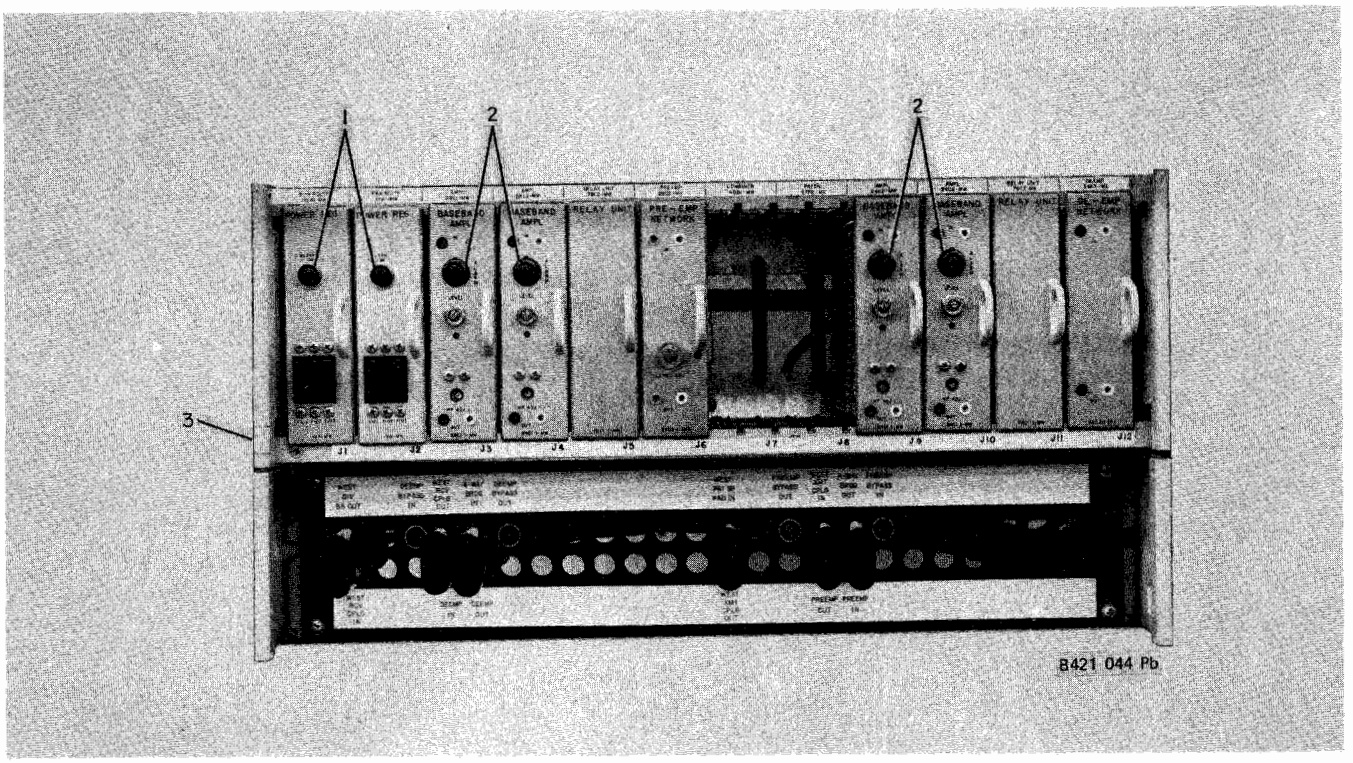

Figure 3-10. 99G2-MW Coupling Subsystem

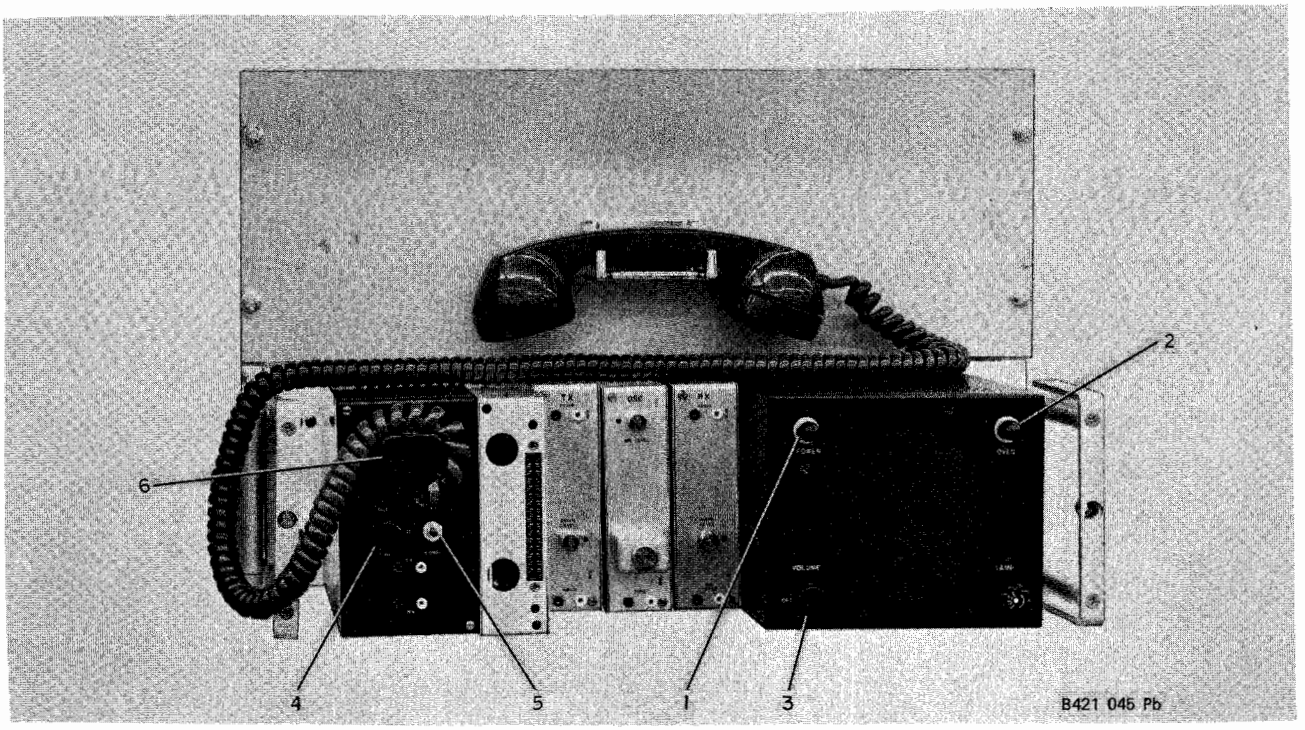

Figure 3-11. 90A1-MX (MOD) Audio Service Channel

TABLE 3-12. FAULT ALARM RECEIVER SET CONTROLS AND INDICATORS

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
FA-102 DATA RECEIVER INDICATORS (FIGURE 3-12)				
1	Lettered REGISTER INDICATOR lamp (green lens)	When lighted, indicates correct scanning sequence at companion transmitter	Register and data indicator (green lens) — 6 units	OFF (unless data is being received)
2	Numbered REGISTER INDICATOR lamp (red lens)	When lighted, indicates fault input at companion transmitter	Register and data indicator (red lens) — 17 units	OFF
3	ERROR INDICATOR (amber lens)	When lighted, indicates incorrect or incomplete scanning sequence at companion transmitter	Error indicator	OFF
18D1-FA FAULT ALARM CONTROL PANEL INDICATORS (FIGURE 3-13)				
1	STATION REPORTING lamps (1-17) (red lens)	When lighted, indicates fault condition at numbered transmitting station	Unit front panel	OFF
2	STATION SELECT lamps (1-17) (green lens)	When lighted, indicates that selected station fault data is being routed to common data receiver	Unit front panel	OFF
3	ALARM DISABLE lamp (red lens)	When lighted, indicates that one, or more, of the alarm disable switches is in the down position	Unit front panel	OFF

TABLE 3-12. (Continued)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
18D1-FA FAULT ALARM CONTROL PANEL INDICATORS (FIGURE 3-13) (Cont)				
4	TRANSFER lamp (green lens)	Not implemented on this system		
5	STATUS-ENTER lamps (amber lens)	Not implemented on this system		
FA-102 MAJOR ALARM AND LOCAL INDICATORS (FIGURE 3-14)				
1	Red indicator lamp, DS301	When lighted, indicates presence of major fault input	Major alarm indicator	OFF
2	Red indicator lamp, DS101	When lighted, indicates presence of local fault	Data indicator	OFF
FA-102 DATA RECEIVER CONTROLS (FIGURE 3-12)				
4	ALARM OFF	Not implemented on this system		
5	A TEST	When depressed, causes the A generator to operate for test and alignment	Shift pulse generator	Disengaged
	TEST	When depressed, causes a 10-dB drop in signal level for alignment purposes	Tone detector (not shown; in separate card cage)	Disengaged

TABLE 3-12. (Continued)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
18D1-FA FAULT ALARM CONTROL PANEL CONTROLS (FIGURE 3-13)				
6	STATION SELECT	Selects the desired tone detector output to be applied to the common data receiver	Unit front panel	Rotated until the STATION SELECT lamp corresponding to a lighted STATION REPORTING lamp is lighted
7	ALARM DISABLE	When in the down position, the tone detector output (corresponding to a particular station's fault signal) is disconnected from the common output	Unit front panel	Up position
8	STATION CLEAR/ INTERROGATE-OPERATE	Not implemented on this system		
9	CONTROL FUNCTIONS	Not implemented on this system		
FA-102 MAJOR ALARM AND LOCAL INDICATOR CONTROLS (FIGURE 3-14)				
3	ALARM TEST	When pressed, simulates an alarm condition for test purposes	Major alarm indicator	Disengaged
4	ALARM RELEASE	When pressed, resets the alarm holding circuit	Major alarm indicator	Disengaged
5	ALARM OFF	In the up position, causes that fault input to be selected as a major fault	Data indicator	

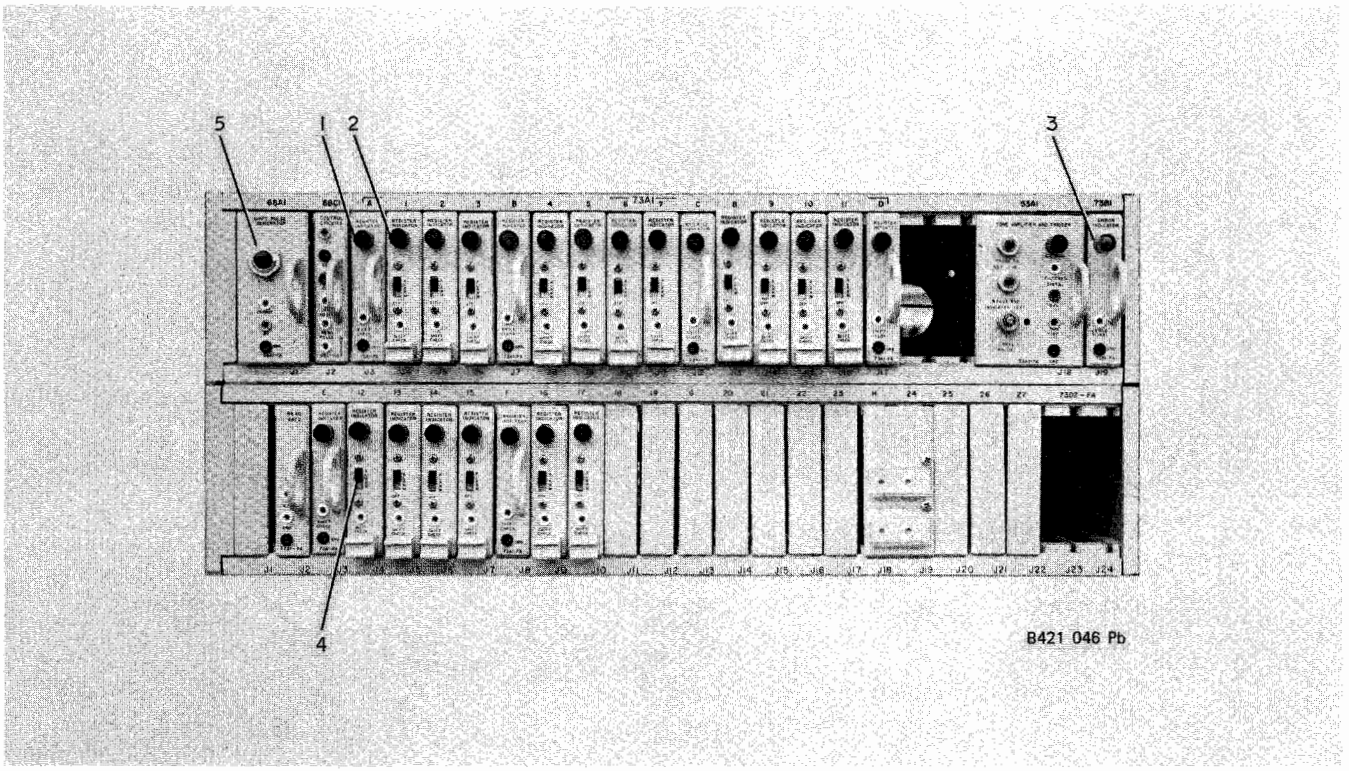

Figure 3-12. FA-102 Data Receiver (Part of Receiver Set)

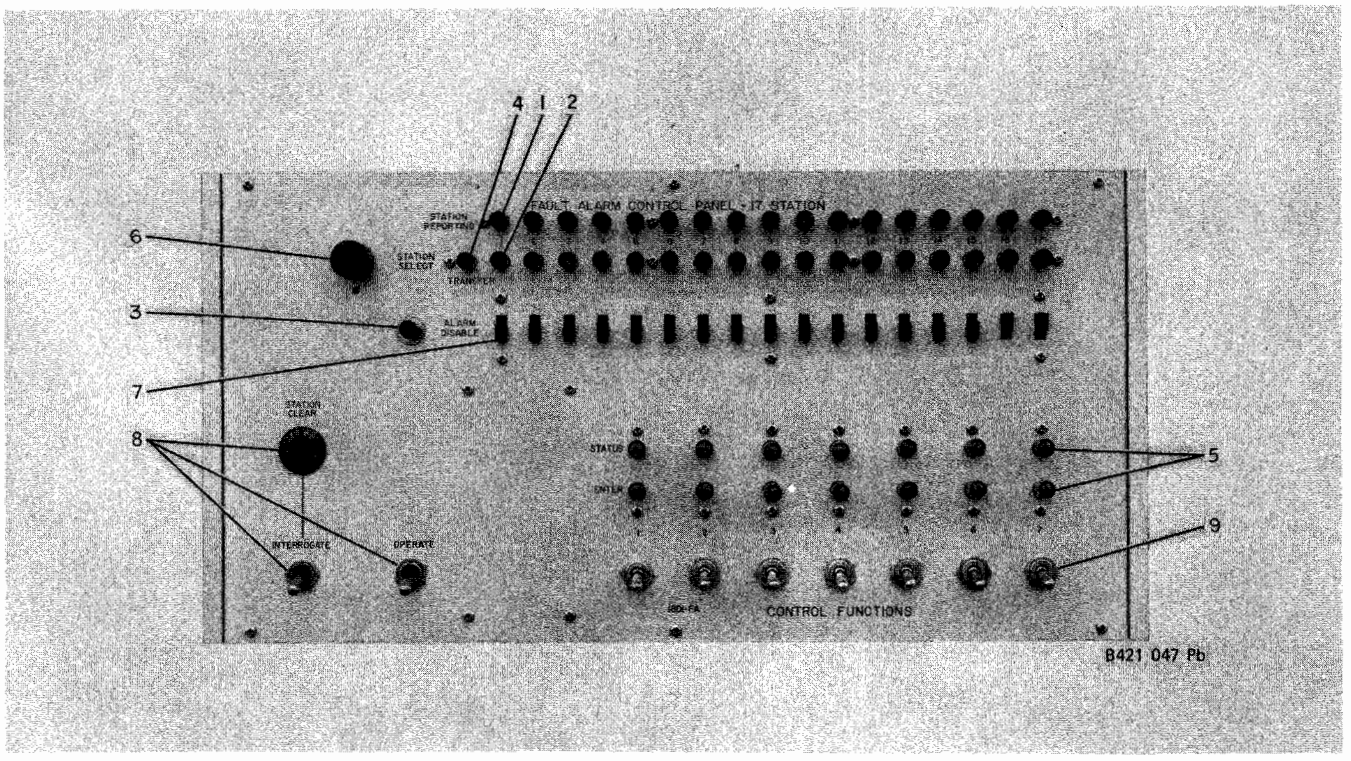

Figure 3-13. 18D1-FA Fault Alarm Control Panel (Part of Receiver Set)

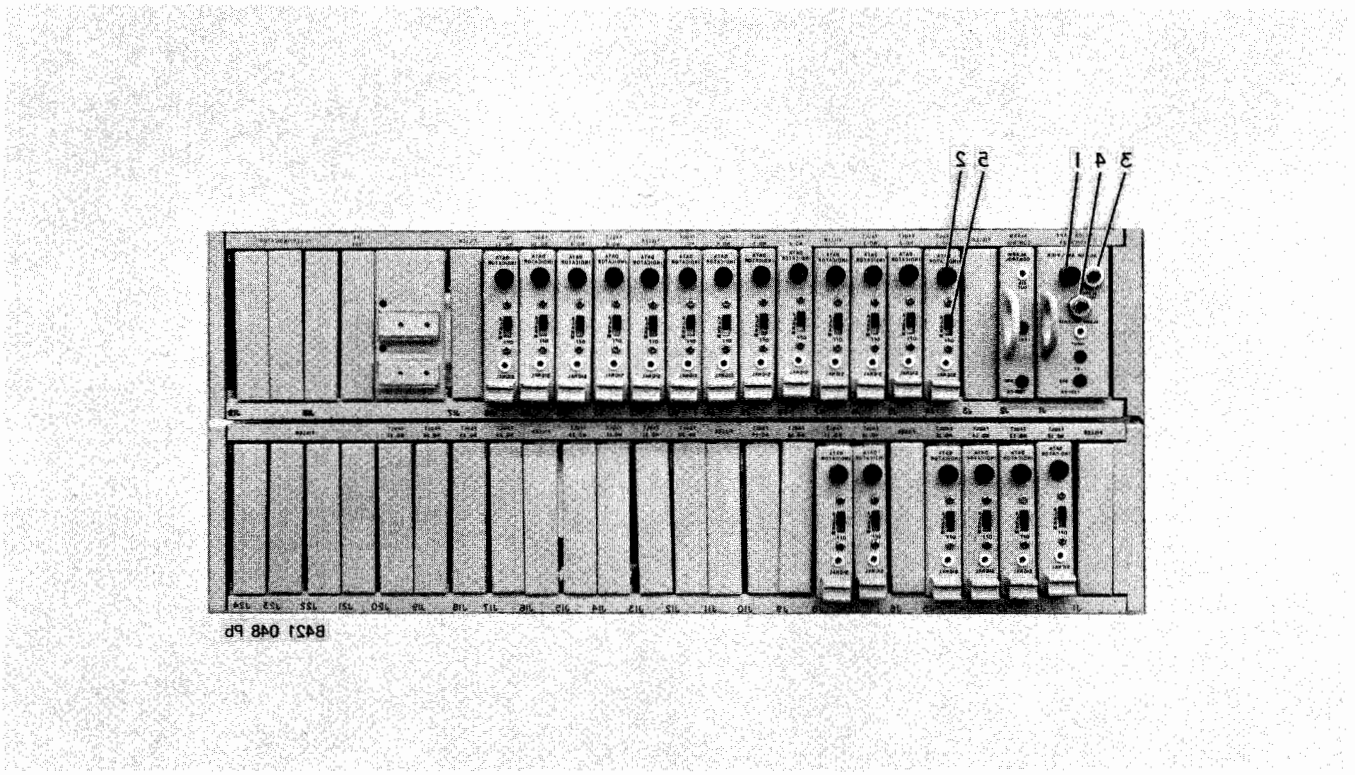

Figure 3-14. FA-102 Major Alarm and Local Indicator (Part of Receiver Set)

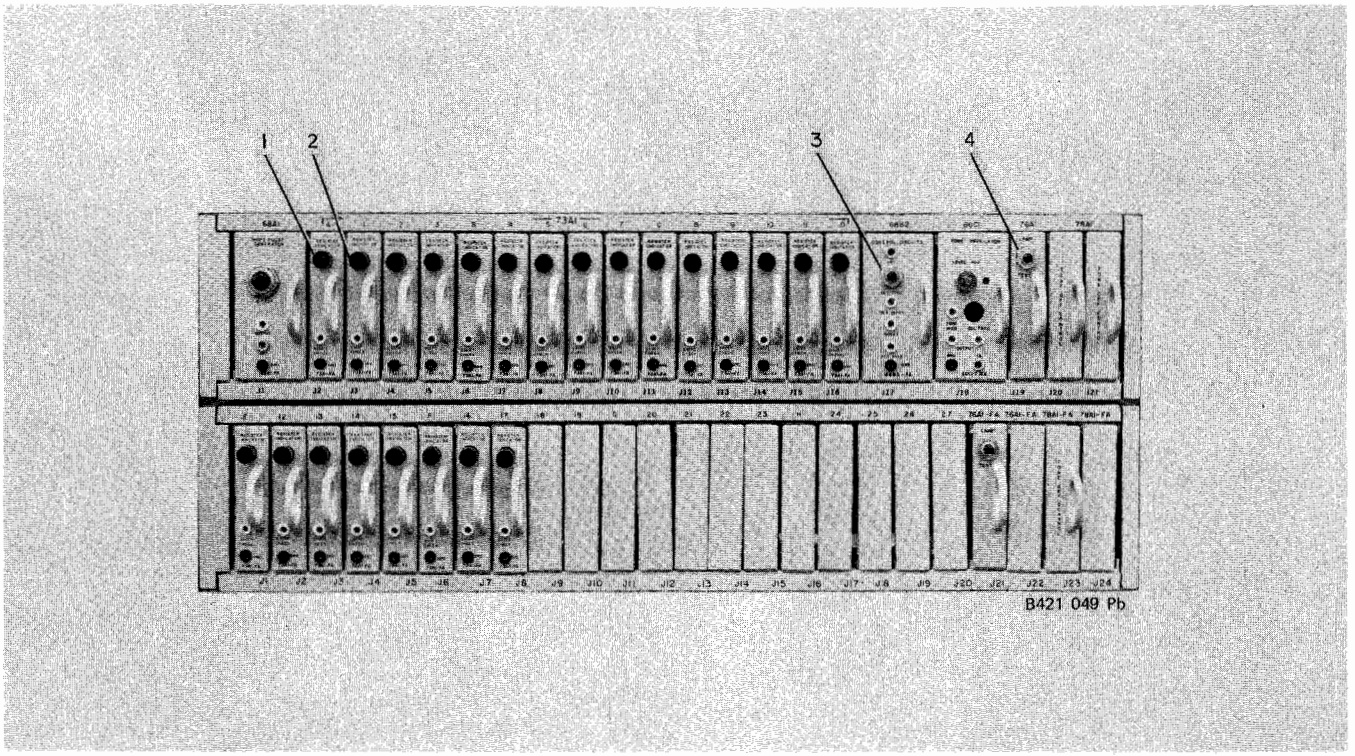

Figure 3-15. FA-102 Data Transmitter

TABLE 3-13. FA-102 DATA TRANSMITTER CONTROLS AND INDICATORS (FIGURE 3-15)

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS		
1	Lettered REGISTER INDICATOR lamp (green lens)	When lighted, indicates correct scanning sequence	Register and data indicator (green lens)	Lighted
2	Numbered REGISTER INDICATOR lamps (red lens)	When lighted, indicates presence of fault input	Register and data indicator (red lens)	OFF
		CONTROLS		
3	SET TONE	When pressed, keys the tone oscillator on	Control circuits	Disengaged
4	LAMP TEST	When pressed, simulates a fault input on up to 11 associated data indicator units	Register and Indicator tester	Disengaged

TABLE 3-14. ANTENNA SET CONTROLS AND INDICATORS

INDEX NO.	INDICATOR/SWITCH POSITION/CONTROL	FUNCTION MONITORED/ FUNCTION	LOCATION	NORMAL INDICATION/ POSITION
		INDICATORS		
	POWER indicator lamp	Primary power to unit	Automatic dehydrator front panel	Lighted
	LINE PRESSURE gauge	Pressure in psig of air to manifold	Automatic dehydrator front panel	4 psig
	HUMIDITY INDICATOR	Relative humidity of delivered air	Automatic dehydrator front panel	Dark blue
	Pressure gauge	Pressure in psig of air to individual waveguide run	6600A manifold assembly	4 psig
		CONTROLS		
	ON/OFF switch	Applies primary electrical power to dehydrator	Automatic dehydrator front panel	ON
	Needle valve	Provides individual line isolation of associated waveguide and application of line pressure uncommon to rest of waveguide pressurization system	6600A manifold assembly	Open

TABLE 3-15. OPERATING PROCEDURES

EQUIPMENT	STARTING	STOPPING	EMERGENCY
55E22E-(3,4)MW Receiver Subsystem	1. On receiver power and control unit, set the ON/OFF switch to ON. 2. Allow at least 2 hours warmup to permit frequency stabilization. 3. Set the waveguide shutter control to OPEN. 4. On receiver power and control unit, set the meter switch to V OUT. If the meter does not indicate between 39 and 36 and if primary input voltage is known to be correct, adjust -20 V ADJ control for a meter indication of 37.5. 5. Rotate meter switch to all other positions. Verify meter indication is upscale (in red area) for each function.	1. Set waveguide shutter control to CLOSED. 2. Set the ON/OFF switch on the power and control unit to OFF.	Emergency operation of a failed receiver is not possible unless the failure can be isolated to a malfunction in the solid-state source. In an emergency, any local oscillator can be tuned to operate in a free-running mode at any frequency in the band. 1. Disconnect the wire normally connected to the ØLOCK terminal. This wire is left disconnected for emergency operation. 2. Connect the electronic counter to the power output jack. 3. Adjust the controlled oscillator tuning control to the desired frequency. Reconnect the power output to the waveguide assembly and place the system into emergency service. 4. Replace the local oscillator with a good unit as soon as possible. Note If receiver failure cannot be traced to trouble in local oscillator, and if receiver is operating in a diversity configuration with an alternate receiver, set the NORMAL/DISABLE switch on the associated diversity control unit to the receiver, A or B, that has failed.

TABLE 3-15. (Continued)

EQUIPMENT	STARTING	STOPPING	EMERGENCY
53E22C-(3,4)MW Transmitter Subsystem	1. On klystron power and control unit, set POWER pushbutton to PUSH ON. 2. Set OFF-LOW-NORMAL-HIGH switch to NORMAL. 3. Set AFC control to ON. 4. Allow at least 5 hours warmup to permit frequency stabilization. 5. Set waveguide shutter control to OPEN. 6. On klystron power and control unit, rotate meter switch to each position. In general, meter will indicate in the red area for each position; however, the readings obtained during the last periodic check should be used as a guide because some readings vary with adjustment settings.	1. Set waveguide shutter control to CLOSED. 2. On klystron power and control unit, set the POWER pushbutton to PULL OFF.	1. If primary preamplifier in 27E8-MW fails, remove looping plug between TRK 1 OUT jack and MOD PRIM IN jack from jackfield. Insert looping plug between TRK 1 OUT jack and MOD AUX IN jack in jackfield.

TABLE 3-15. (Continued)

EQUIPMENT	STARTING	STOPPING	EMERGENCY
	7. Observe the indication on the afc meter. The meter should indicate a null (live zero) with the klystron circuit switch set to NORMAL.		
55F30A-(1,2)MW Receiver Subsystem	Perform the starting procedure listed for the 55E22E-(3,4)MW Receiver Subsystem.	Perform the stopping procedure listed for the 55E22E-(3,4)MW Receiver Subsystem.	Perform the emergency procedure listed for the 55E22E-(3,4)MW Receiver Subsystem.
65F1A-(1,2)MW Transmit Converter Subsystem	1. On the transmit power and control unit, set the ON/OFF switch to ON. 2. Set the AFC switch to NORMAL. 3. Press the AFC ALARM RESET pushbutton to reset the alarm circuits. 4. On transmit power and control unit, rotate meter switch to each position; however, the readings obtained during the last periodic check should be used as a guide because some readings vary with adjustment settings.	Set the ON/OFF switch on the transmit power and control unit to OFF.	1. If there is a malfunction in the solid-state source, perform the emergency procedure listed for the 55E22E-(3,4)MW Receiver Subsystem, omitting the Note. 2. No corrective emergency operation is possible if there is a failure in the waveguide assembly, 70-MHz amplifier, or the transmit power and control unit. In the event of such a malfunction, set the power and control unit ON/OFF switch to OFF, the waveguide shutter control on the associated twt power amplifier to CLOSED, and the toggle switch on the twt power supply to OFF.

TABLE 3-15. (Continued)

EQUIPMENT	STARTING	STOPPING	EMERGENCY
50F11-(1,2)MW TWT Power Amplifier Subsystem	1. Set the OFF toggle switch on the power supply to ON (up) and the status switch to TUNE (up). Allow 2.5 minutes warmup. 2. When the subsystem has been properly tuned and aligned, set the waveguide shutter control to OPEN and the status switch to OPERATE. The SHUTTER CLOSED lamp on the monitor unit and the OVERLOAD ALARM lamp on the power supply should both be off. 3. Verify front panel meter indications with the readings recorded during the last periodic check.	1. Set the waveguide shutter control to CLOSED. The SHUTTER CLOSED lamp on the power monitor unit should light. 2. Set the OFF switch on the power supply to OFF (down).	No emergency operation of a failed subsystem is possible. If a failure occurs, set the OFF switch on the twt power supply to OFF (down) and set the waveguide shutter control to CLOSED.
35A1-MW FM Transmitter Subsystem	Power is applied to the subsystem from the primary rack voltage. This voltage is through the 16N1-MW Power Converter. Verify that the 16N1-MW is fully inserted into the card cage connector.	Slide the 16N1-MW out of the card cage far enough to disengage it from the card cage connector.	No emergency operation is possible except for substitution of modules.

TABLE 3-15. (Continued)

EQUIPMENT	STARTING	STOPPING	EMERGENCY
90E2-MW 1:1 IF. Switching Subsystem	Perform the starting procecure listed for the 35A1-MW.	Perform the stopping procedure listed for the 35A1-MW.	1. If there is a failure in the A path (A pilot converter, A pilot/noise sensor, or A power converter), set the NORMAL/DISABLE switch on the control unit to A and perform module substitution. 2. If there is a failure in the B path (B pilot converter, B pilot/noise sensor, or B power converter), set the NORMAL/DISABLE switch to B and perform module substitution. Note Jacks named in the following step are located on the subsystem jackfield. Only the output of one receiver can be used at a time. Because the if. switch subsystem senses the baseband output of the receivers and switches the if. of the better receiver, either the baseband output, the if. output, or both, can be jumpered, as required. 3. If there is a failure in the comparator unit, control unit, diode switch, or in both units in a redundant path, resulting in a loss of subsystem output, connect a looping plug or cable between jacks J26 (A RX B/B OUT) and J27 (B/B TRK 1 IN) to keep path A receiver on line, or connect a looping plug or cable between jacks J28 (B RX B/B OUT) and J27 (B/B TRK 1 IN) to keep path B receiver on line. Also, connect a looping

TABLE 3-15. (Continued)

EQUIPMENT	STARTING	STOPPING	EMERGENCY
			plug or cable between jacks J34 (A RX IF. OUT) and J36 (SPLIT'G PAD IN) to keep the if. output of receiver A on line, or connect a looping plug or cable between jacks J35 (B RX IF. OUT) and J36 (SPLIT'G PAD IN) to keep the if. output of receiver B on line.
90C2-MW Diversity Subsystem	Subsystem power is from the primary rack power source. Squelching of a failed receiver is automatic.	Manual squelching of receivers, for maintenance only, can be done by setting the NORMAL/ DISABLE switch on the control unit to either A or B to disable the receiver selected. Be sure to return this switch to NORMAL to ensure automatic subsystem operation.	1. If path A is lost, perform step 1. of the 90E2-MW emergency procedure. 2. If path B is lost, perform step 2. of the 90E2-MW emergency procedure. 3. If the subsystem output is lost completely (failed continuity pilot stop filter, control unit, or the simultaneous failure of modules in a redundant path), perform the following: connect a looping plug or cable between jacks J26 (A RX B/B OUT) and J27 (B/B TRK 1 IN) to connect the A receiver on line, or between jacks J28 (B RX B/B OUT) and J27 (B/B TRK 1 IN) to keep the B receiver on line. This procedure may cause loss of use of the service channel.
99G2-MW Coupling Subsystem	The subsystem operates from the primary rack voltage. This voltage is through the 16K1-MW Power Converter. Verify that the 16K1-MW is fully inserted into the card cage connector.	Slide the 16K1-MW out of the card cage far enough to disengage it from the card cage connector.	No emergency operation is possible except for module substitution. Always use a module that has been previously aligned in an operating subsystem.

TABLE 3-15. (Continued)

EQUIPMENT	STARTING	STOPPING	EMERGENCY
90A1-MX Audio Service Channel	1. Set the ON/OFF VOLUME control to ON. The POWER lamp should light. 2. Turn the VOLUME control to midrange. 3. Plug the headset into the TEL SET jacks, or lift the telephone set from the cradle and press the CALL SIGNAL push-button to alert the distant party. 4. When contact is established, adjust the SIDE TONE and VOLUME controls to the desired level. Note When the headset is not plugged into the TEL SET jacks, the system audio and signaling traffic is heard on the front-panel speaker at a normal operating level. When the headset is plugged in, the traffic is heard in the headset receiver at a normal level and on the speaker at a lower	Turn the ON/OFF VOLUME control fully counterclockwise to OFF. The POWER lamp should go out.	No emergency operation is possible except for module substitution.

TABLE 3-15. (Continued)

EQUIPMENT	STARTING	STOPPING	EMERGENCY
	level. This feature prevents station personnel from missing traffic for their station even when the headset is inadvertently left plugged in during periods of nonusage.		
FA-102 Fault Alarm Receiver Set	1. Power for the set is derived from an associated 16N1-MW Power Converter. Verify that the 16N1-MW is fully inserted into the card cage connector. 2. When an incoming fault signal is present, a STATION REPORTING lamp lights on the 18D1-FA Alarm Control Panel. The STATION SELECT switch must be rotated until the corresponding STATION SELECT lamp lights. This action routes the fault data of the reporting station to the FA-102 Data Receiver. 3. The nature of the reported fault is indicated by the register and data indicator stages of the data receiver.	Slide the 16N1-MW out of the card cage far enough to disengage it from the connector.	Failure of the receiver set does not constitute an emergency because system communications are not affected. To restore a failed receiver set, replace blown fuses and perform module substitution.

TABLE 3-15. (Continued)

EQUIPMENT	STARTING	STOPPING	EMERGENCY
	4. On the major alarm and local indicator, any monitored fault may be selected as a major fault. A selected major fault lights the associated data indicator lamp and activates major alarms. To select a fault as a major alarm, set the ALARM/OFF switch on the applicable 73C2-FA Data Indicator to ALARM.		
FA-102 Data Transmitter	There are no on/off switches associated with the data transmitter. Operating voltages are from primary power connected to the shelf terminal board. The data transmitter is designed for continuous unattended operation.	See the STARTING procedure.	See the emergency procedure for the FA-102 Fault Alarm Receiver Set.
Antenna Set	There are no on/off switches associated with the antenna set. Operation is continuous and unattended.	See STARTING procedure.	No emergency operation is possible except for direct replacement of the dehydrator or associated valves.

TABLE 3-15. (Continued)

EQUIPMENT	STARTING	STOPPING	EMERGENCY
Technical Control Equipment	There are no on/off switches associated with the technical control equipment. Operating voltages are derived from the primary power applied to the rack through the power distribution panel at the top of the rack. To restore power, set the A or B circuit breaker to ON.	See STARTING procedure. To remove power, set the A or B circuit breaker to OFF.	No emergency operation is possible except for module substitution.

SECTION 4

TROUBLESHOOTING

4.1 INTRODUCTION

This section provides the information required for a technician to quickly and efficiently locate the cause of a system malfunction or performance deterioration. Included in this section are the six logical troubleshooting steps, functional descriptions and block diagrams of each station, and a troubleshooting guide for use at the master control station (Londonderry).

4.2 LOGICAL TROUBLESHOOTING

The steps listed below are necessary for quick and efficient troubleshooting of any system or equipment. The technician should recognize that these troubleshooting steps are guides only; unique problems may require unique troubleshooting techniques.

4.2.1 SYMPTOM RECOGNITION

This is the first step in the troubleshooting procedure and is based on a complete knowledge and understanding of equipment operating characteristics. All equipment troubles are not the direct result of component failure. Therefore, a trouble in an equipment or system is not always easy to recognize because all conditions of less than peak performance are not always apparent. This type of equipment or system trouble is usually discovered while performing preventive maintenance procedures, such as the POMSEE or PMS checks. It is important that the not-so-apparent troubles, as well as the apparent troubles, be recognized.

4.2.2 SYMPTOM ELABORATION

After an equipment or system trouble has been recognized, all the available aids designed into the equipment or system should be used to further elaborate on the original trouble symptom. Use of the fault alarm system, front panel controls, and other built-in indicating or testing aids should provide better identification of the original trouble symptom. Also, checking or otherwise manipulating the operating controls may eliminate the trouble.

4.2.3 LISTING PROBABLE FAULTY FUNCTION

The next step in logical troubleshooting is to formulate a number of logical choices as to the cause and likely location of the trouble. The logical choices are mental decisions that are based on knowledge of the equipment or system operation, a full identification of the trouble symptom, and information contained in this manual. The overall and station function descriptions and the associated block diagrams should be referred to when selecting possible faulty functional sections.

4.2.4 LOCALIZING THE FAULTY FUNCTION

For the greatest efficiency in localizing trouble, the functional sections that have been selected by the logical choice method should be tested in an order that requires the least time. This order requires a mental selection to determine which station or section within the station to test first. The selection should be based on the validity of the logical choice and the difficulties in making the necessary tests. If the tests do not prove that station or functional section to be at fault, the next selection should be tested, and so on until the faulty station or section is located. As aids in this process, the manual contains a functional description and a block diagram for each functional station.

4.2.5 LOCALIZING TROUBLE TO THE CIRCUIT

After the faulty station or subsystem has been isolated, it is often necessary to make additional logical choices as to which group of circuits or circuit is at fault. Block diagrams for each station, combined with the signal flow diagrams in section 5, provide the signal and test information needed to bracket and then isolate the faulty station and subsystem. To further localize a trouble within a specific subsystem, refer to the appropriate commercial equipment manual (listed in the introduction to this manual).

4.2.6 FAILURE ANALYSIS

After the trouble (faulty station, subsystem, etc.) has been located (but before performing corrective action), the procedures followed up to this point should be reviewed to determine exactly why the trouble occurred in the manner it did. This review is usually necessary to make certain that the fault discovered is actually the cause of the malfunction, and not just the result of the malfunction.

4.3 OVERALL FUNCTIONAL SYSTEM DESCRIPTION

The microwave system provides multichannel, full-duplex communications for Thurso, Edzell, and Dungiven with Londonderry, the master control station. Eleven repeater stations complete the line-of-sight paths. Refer to figure 4-1.

The system contains both 1- and 5-watt rf equipment. One-watt equipment (Collins MW-508D) is present at Thurso, Latheron, Mormond Hill, Kinnaber, and Edzell. Five-watt equipment (Collins MW-509E) is present at all other stations. At the Latheron and Mormond Hill stations, the 1-watt signal is boosted by a power amplifier to 5 watts for the over-water hop. The Dungiven-Londonderry hop is via an existing microwave link.

Each remote terminal (Thurso, Edzell, and Dungiven) has multiplex communications only with Londonderry. The only communications possible between remote terminals or repeater stations is via the audio service channel. The Thurso station is equipped with 24 channels, of which 12 are spares. These channels are assigned to Supergroup 2, Basegroups 3 and 5. Mormond Hill (a repeater station with drop and insertion capabilities) has an Air Force interconnect with an existing communications system. This interconnect picks up two basegroups that are routed to Londonderry. These groups are Basegroups 1 and 2 of Supergroup 2. The Edzell station is equipped with 12 channels. These channels are assigned to Supergroup 2, Basegroup 4. Dungiven has 60 channels, of which 48 are terminated and 12 are equipped spares. These 60 channels are assigned to Supergroup 3, Basegroups 2, 3, 4 and 5, and Supergroup 2. Basegroups 2, 3 and 4 in Supergroup 3 are receive-only channels from Londonderry. Basegroup 5 is a full-duplex set of channels with Londonderry. The 12 channels in Supergroup 2 are reserved for restoration purposes. Londonderry has 96 channels; 48 in Supergroup 2 and 48 in Supergroup 3. Basegroups 2, 3 and 4 in Supergroup 3 are transmit-only channels to Dungiven. Basegroup 5 is for full-duplex operation with Dungiven. In Supergroup 2, Basegroups 1 and 2 are for the Air Force interconnect from Mormond Hill. Basegroup 4 is for the Edzell channels and Basegroup 5 is for the Thurso channels.

The system uses a radio continuity pilot of 1.499 MHz, a multiplex synchronizing pilot of 96.0 kHz, and 104.08-kHz group pilot frequencies. For a detailed description of the multiplex equipment, refer to the technical manual for Multiplex Set AN/UCC-4.

4.4 FUNCTIONAL STATION DESCRIPTIONS

In the following paragraphs, the stations are described only to the subsystem level. For detailed descriptions of the individual subsystems, refer to the appropriate commercial manual (listed in the introduction of this manual).

4.4.1 THURSO STATION

The Thurso station is the northernmost station in Scotland. This station is configured as a remodulating terminal using Collins MW-508D radio equipment and a 99G2-MW Coupling Subsystem to interface with the AN/UCC-4 multiplex equipment.

For the signal flow of the voice frequencies, refer to drawing 607-1962 in section 5. The voice frequency circuits from the telephone lines, etc., are routed to the circuit patch bay via the combined distribution frame (CDF). The circuit patch bay provides testing and patching capabilities for the voice circuits at a 0-dBm transmit and receive level. From the circuit patch bay, the circuits are routed to the conditioning pads in the sf rack, again via the CDF. The pads convert the circuits from the 0 dBm/0 dBm (receive and transmit) levels to +7 dBm/-16 dBm levels. From the pads, the circuits are routed through the CDF to the sf signaling units in the sf rack. These signaling units convert the signaling tones from the Londonderry station to "E" type signaling pulses and also convert the locally generated "M" type pulses to signaling tones for transmission to Londonderry. From the signaling unit, the voice

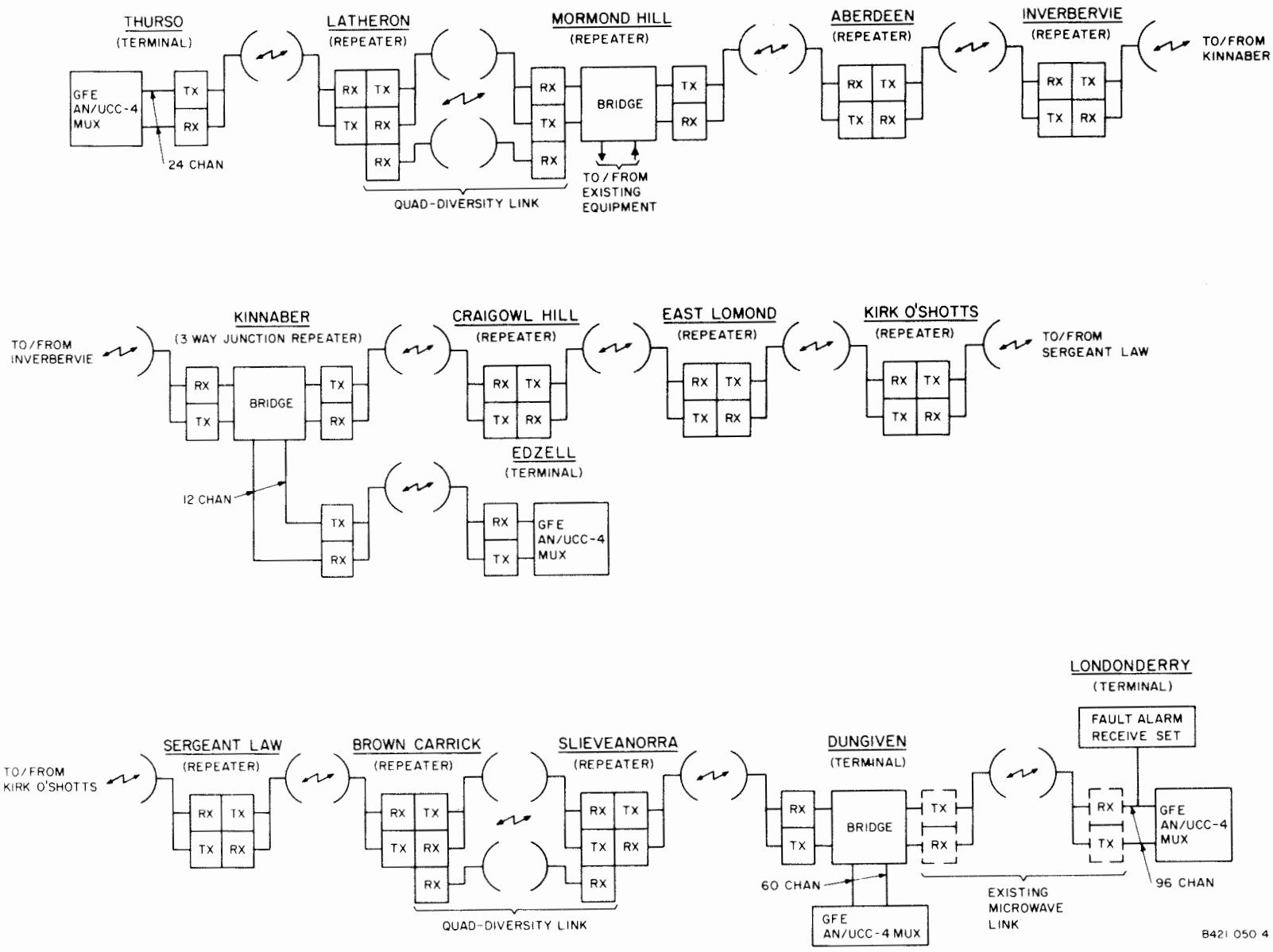

Figure 4-1. Overall System Block Diagram

circuits are routed via the CDF to the vf patch bay, which provides testing and patching capabilities at the +7-dBm receive and -16-dBm transmit levels. At this point, the voice circuits interface with the multiplex equipment.

The coupling subsystem is the primary interface between the multiplex equipment and the rf equipment. (See figure 4-2 for a block diagram of the Thurso station.) The coupling subsystem applies preemphasis and level and impedance matching to the multiplex signals before applying the combined multiplex signals (baseband) to the transmitter subsystems. Each remodulating transmitter uses the baseband to directly modulate the transmitter klystron. The service channel and fault alarm data are applied to the modulation amplifier auxiliary input in the transmitter subsystem and are transmitted along with the baseband. Note that the service channel operates independently of the baseband signal and is used as an interstation party line for maintenance personnel and for transmitting the fault data to the master control station (Londonderry). Thurso has two transmitters arranged for frequency diversity operation. In this type of arrangement, the baseband signal is transmitted over two parallel paths at different frequencies. Since different frequencies tend to fade independently, one path is usually at or near normal strength. Thus, continuous communication is literally assured. On the receive side, two receivers are used, each operating at a different frequency. The receiver subsystems each produce a demodulated output (baseband) that is applied to the diversity subsystem. The diversity subsystem combines these two outputs to produce a single output that has a better signal-to-noise ratio than either of the received signals. The diversity subsystem also routes the service channel information to the local audio service channel. The baseband output from the diversity subsystem is applied to the coupling subsystem, which provides level and impedance matching and deemphasis to the baseband signal. The baseband signal is then routed to the multiplex equipment.

One 8-foot parabolic antenna is used at Thurso. The two transmitter and two receiver subsystems are connected to this antenna through circulators and elliptical waveguide. The antenna system also has an automatic dehydrator that provides waveguide pressurization. The antenna is mounted on a 110-foot self-supporting tower. (For tower and antenna details, refer to the installation drawings.)

The dc power plant consists of two 50-ampere rectifier/chargers, a low-voltage disconnect panel, a 420-ampere-hour battery bank, a counter emf cell, and a deluge shower. The battery bank is capable of being used for 8 hours without any significant decrease in operating voltage. The battery chargers and counter emf cell operate as described for the Latheron station. The deluge shower is an emergency shower and eyewash fountain that can be used by personnel that come in contact with battery acid.

4.4.2 LATHERON STATION

The Latheron station is configured as a repeater station and is between Thurso and Mormond Hill. This station uses Collins remodulating MW-508D radio equipment and 99G2-MW Coupling Subsystems. (See figure 4-3 for a block diagram of the Latheron station.)

The two received signals from Thurso, each at a different frequency, are demodulated by the receiver subsystems and are applied to the diversity subsystem. As described for Thurso, the diversity output is a single baseband signal that has a better signal-to-noise ratio than either received signal. The diversity subsystem also routes the service channel information from Thurso to the audio service channel. The baseband output from the diversity is coupled through a coupling subsystem, a 30-dB pad, and another coupling subsystem to the transmitter subsystems for the Mormond Hill link. The two coupling subsystems and the pad apply the required deemphasis, preemphasis, and level and impedance matching for the associated receiver and transmitter subsystems. Each remodulating transmitter uses the baseband to directly modulate the transmitter klystron. The service channel and fault alarm data are applied to the modulation amplifier auxiliary input in the transmitter subsystem and are transmitted along with the baseband. Note that the fault alarm data is transmitted only in one direction - toward the master control station.

The output from the transmitter subsystems is boosted to 5 watts by the twt power amplifier subsystems. This boost is necessary because the over-water hop to Mormond Hill is approximately

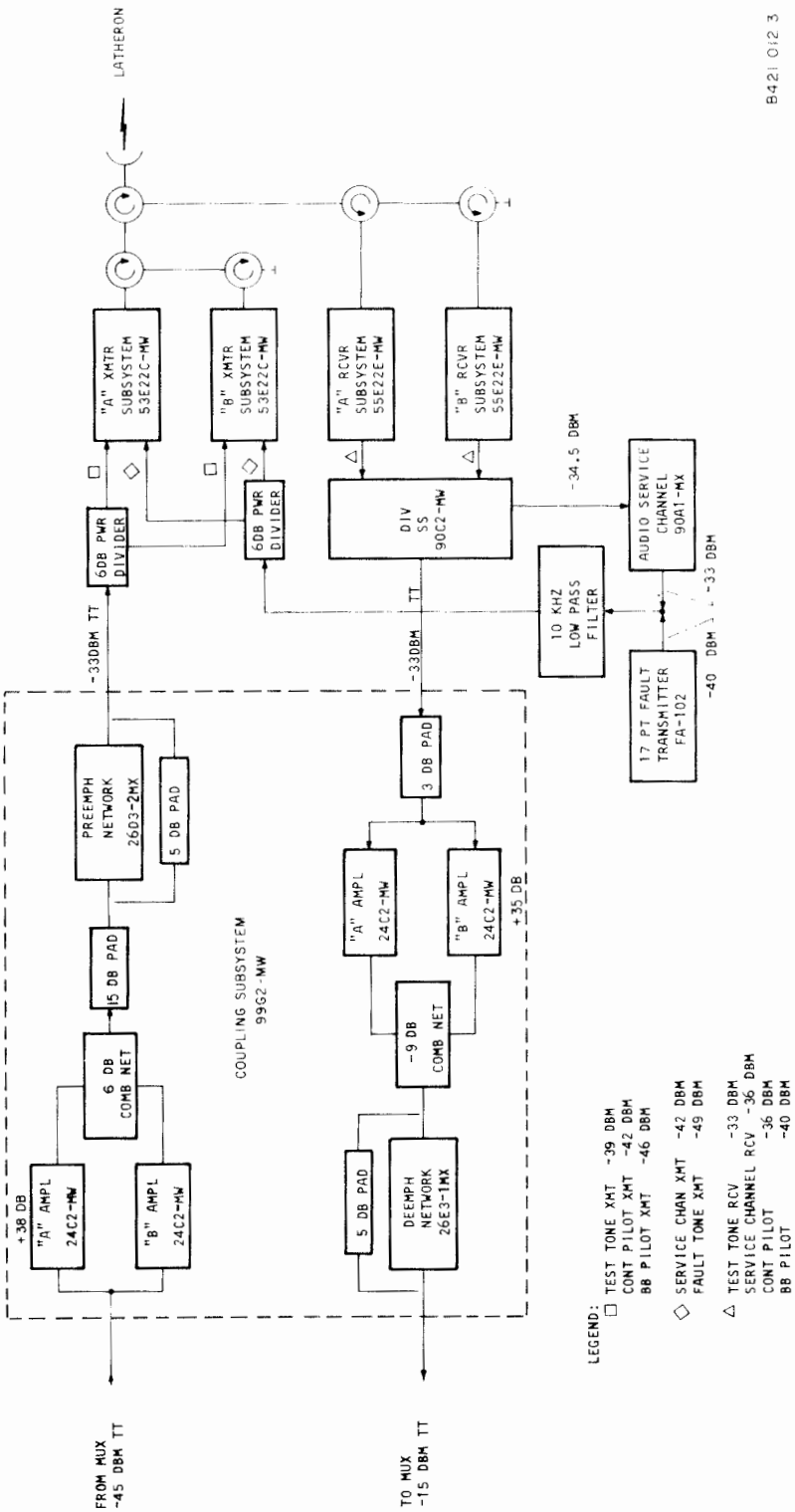

Figure 4-2. Thurso Station Block Diagram

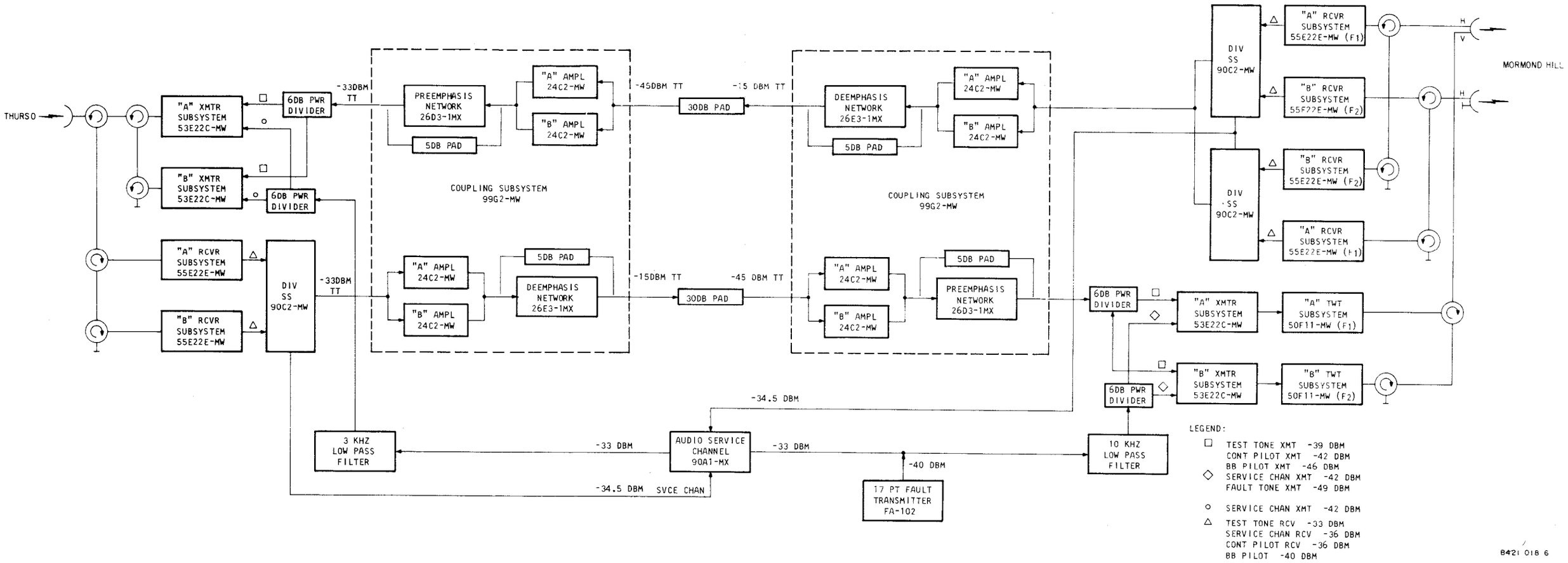

Figure 4-3. Latheron Station Block Diagram

70 miles. Because interrelated fading characteristics exist over this long hop, a quadruple-diversity (quad-diversity) arrangement is necessary. In this arrangement, two rf signals of different frequencies are transmitted from the highest antenna and are received on two antennas that are separated vertically by several hundred wavelengths. This method of transmission and reception takes advantage of the fact that simultaneous fading is unlikely over two separate line-of-sight paths, and is even more unlikely when two separate frequencies are used.

The signals from Mormond Hill are received by four receiver subsystems (two per frequency). One diversity subsystem is used for each set of two receivers. The outputs of the diversity subsystems are combined and are coupled back through the coupling subsystems and 30-dB pad to the transmitter subsystems for transmission to Thurso. The diversity subsystems also route the service channel information to the audio service channel.

Three antennas are used at Latheron and are mounted on a 360-foot guyed tower. One 8-foot parabolic antenna is used for the Latheron-Thurso link and two 12-foot antennas are used for the Latheron-Mormond Hill link. On the 8-foot antenna, two transmitter and two receiver subsystems are connected using circulators and elliptical waveguide. The highest 12-foot antenna has two twt subsystems and two receiver subsystems connected to it, and the lower 12-foot antenna has only two receiver subsystems. (For tower and antenna details, refer to the installation drawings.)

Two transportable shelters are provided at Latheron. The four racks of rf equipment are installed in one 12-foot-long by 8-foot-wide modified type S-280 shelter. The dc power plant is also installed in this shelter. The dc power plant includes a 320-ampere hour battery bank, two 50-ampere rectifier/chargers, a transistor counter emf cell, a low-voltage disconnect panel, a deluge shower, and a fuse panel. The battery bank is capable of being used for 8 hours before the battery voltage decreases below the minimum equipment operating voltage. The chargers/rectifiers supply power to station equipment, and maintain the charge on the battery bank. If the commercial ac power should fail, both rectifiers may be disconnected from the equipment load and the battery bank by operation of circuit breakers. Also, if one of the rectifiers should fail, that rectifier is disconnected by a circuit breaker. If both rectifiers should fail, the battery bank automatically carries the equipment load. The counter emf cell is connected between the battery bank and the load to maintain the load voltage at a constant level. The load disconnect panel monitors the battery voltage and disconnects the battery bank when the battery voltage drops below a preset level. This feature protects the batteries from harmful over-discharge. In actual operation, the battery banks are only a temporary source of power. The engine-generator and the automatic load transfer panel are used to provide emergency power in case of primary ac failure. The transfer panel monitors the ac input and if the ac power fails, the transfer panel causes the engine-generator to start. When the generator reaches speed and has the required output voltage, the generator output is transferred to the line. The dc power plant is operating as if the ac power was uninterrupted. The engine-generator and load transfer panel are installed in the second shelter. This shelter is 12 feet long by 8 feet wide by 6 feet 8 inches high.

4.4.3 MORMOND HILL STATION

The Mormond Hill station is arranged as a repeater station with drop and insertion capabilities to interface with an existing tropo system. This station is located between Latheron and Aberdeen. (See figure 4-4 for a block diagram of the Mormond Hill station.)

The functional operation of the rf and coupling equipment is the same as that described for the Latheron station except in reverse order. Quad-diversity is used for the over-water hop to Latheron and frequency diversity is used for the hop to Aberdeen. The only difference between this station and Latheron is that a 4-way, 4-wire bridge is used between the coupling subsystems. This bridge serves as an interface point with the L carrier equipment in an existing communications system. Thus, the existing system can communicate with the master control station (Londonderry) using Supergroup 2 frequencies. Note that the fault alarm data is transmitted only toward the master control station.

Three antennas are used at Mormond Hill and are mounted on a 360-foot guyed tower. One 10-foot antenna is used for the Mormond Hill-Aberdeen link and two 12-foot antennas are

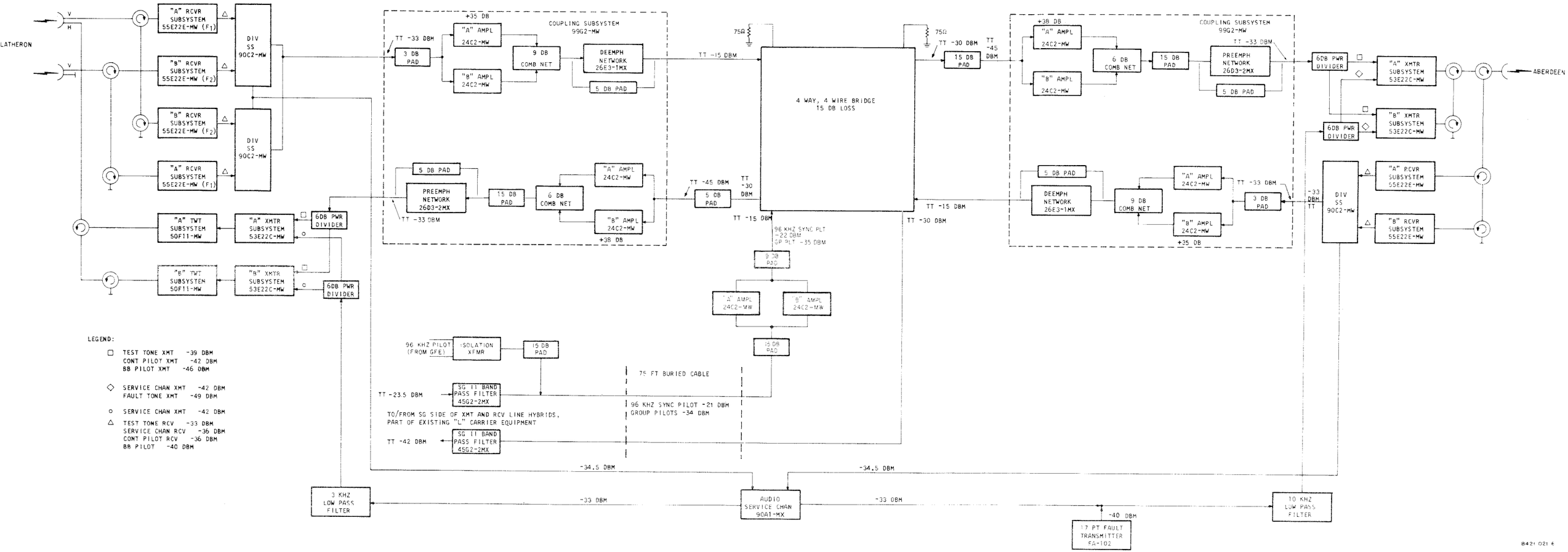

Figure 4-4. Mormond Hill Station Block Diagram

used for the Mormond Hill-Latheron link. To the 10-foot antenna, two transmitter and two receiver subsystems are connected using circulators and elliptical waveguide. The highest 12-foot antenna has two twt subsystems and two receiver subsystems connected to it; the lower 12-foot antenna has only two receiver subsystems. (For tower and antenna details, refer to the installation drawings.)

The dc power plant supplied consists of two 50-ampere battery chargers/rectifiers, a counter emf cell, a low-voltage disconnect panel, a 320-ampere hour battery bank, and a deluge shower. This equipment operates the same as that supplied at Latheron.

4.4.4 ABERDEEN STATION

The Aberdeen station is configured as a heterodyne repeater using Collins MW-509E radio equipment. The station is between Mormond Hill and Inverbervie. (See figure 4-5 for a block diagram of the Aberdeen station.)

The rf channels from Mormond Hill are received by the dual receivers, transformed into 70-MHz outputs, and inserted into the corresponding transmit converter subsystems. The transmit converters heterodyne the if. signals to microwave frequencies and couple the resultant signals to the twt power amplifiers. The twt power amplifiers boost the power to 5 watts for transmission to Inverbervie. The same method is used for the rf channels received from Inverbervie and transmitted to Mormond Hill. The auxiliary baseband outputs from the receivers are combined and applied to the audio service channel. The output from the service channel is applied to transmit converters, while the fault alarm data is applied only to the transmit converters that transmit toward the master control station.

Two parabolic antennas are used at Aberdeen and are mounted on a 30-foot self-supported tower. A 12-foot antenna is used for the Aberdeen-Mormond Hill link and a 6-foot antenna is used for the Aberdeen-Inverbervie link. (For tower and antenna details, refer to the installation drawings.)

Two transportable shelters are provided at Aberdeen. The radio equipment and the dc power plant are in one shelter and the emergency engine-generator in the other. The shelters are the same as those described for Latheron. The dc power plant and the engine-generator are also the same except for a 240-ampere-hour battery bank at Aberdeen.

4.4.5 INVERBERVIE STATION

The Inverbervie station is configured as a heterodyne repeater using Collins MW-509E radio equipment. The station is between Aberdeen and Kinnaber. (See figure 4-6 for a block diagram of the Inverbervie station.)

The functional operation of the rf, service channel, and fault alarm equipment is the same as that described for Aberdeen. Two parabolic antennas are used at Inverbervie and are mounted on a 100-foot guyed tower. Both antennas are 6-foot dishes. (For tower and antenna details, refer to the installation drawings.)

Two transportable shelters are provided at Inverbervie and are equipped the same as the shelters at Aberdeen. The dc power plant and the engine-generator are also the same as at Aberdeen.

4.4.6 KINNABER STATION

The Kinnaber station is arranged as a 3-way junction repeater to interconnect with Inverbervie, Craigowl Hill, and Edzell. Collins MW-508D remodulating radio equipment is used for the Kinnaber-Inverbervie and Kinnaber-Edzell links, and MW-509E heterodyne radio equipment is used for the Kinnaber-Craigowl Hill link. (See figure 4-7 for a block diagram of the Kinnaber station.)

The rf channels from Inverbervie are received by the two remodulating receiver subsystems, combined and improved by the diversity subsystem, and coupled through the coupling subsystem to the 4-way, 4-wire bridging network. This network distributes the signals to the coupling subsystems of the remodulating and heterodyne radios for transmission to Edzell and Craigowl Hill, respectively. A similar routing is undergone for the rf channels received from Edzell and Craigowl Hill. The coupling and remodulating radio equipment operate in the same manner as previously described for Thurso and Latheron. The heterodyne radio equipment operates the same as described for Aberdeen except that the baseband signals from Edzell and Inverbervie are applied first to the fm

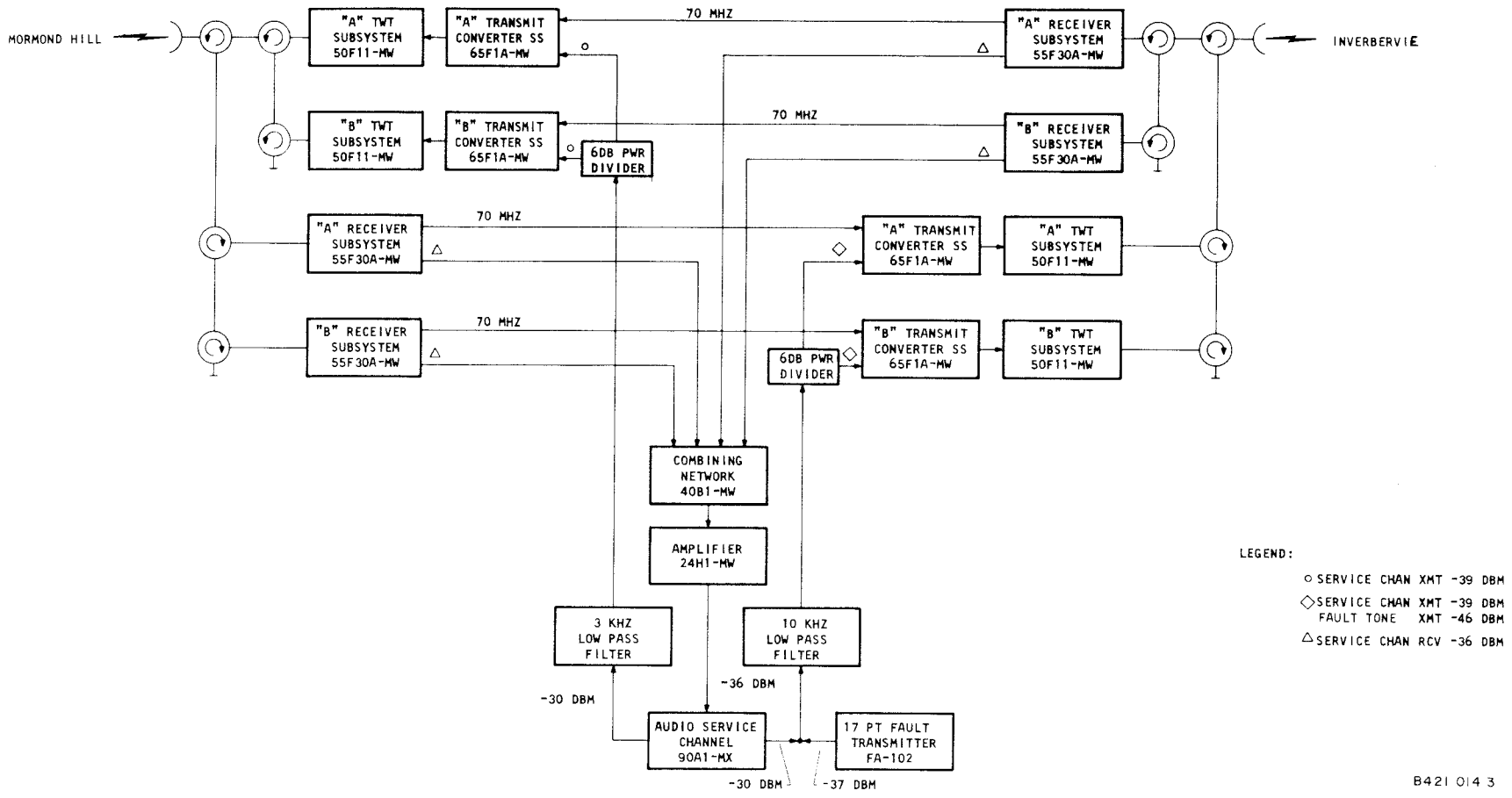

Figure 4-5. Aberdeen Station Block Diagram

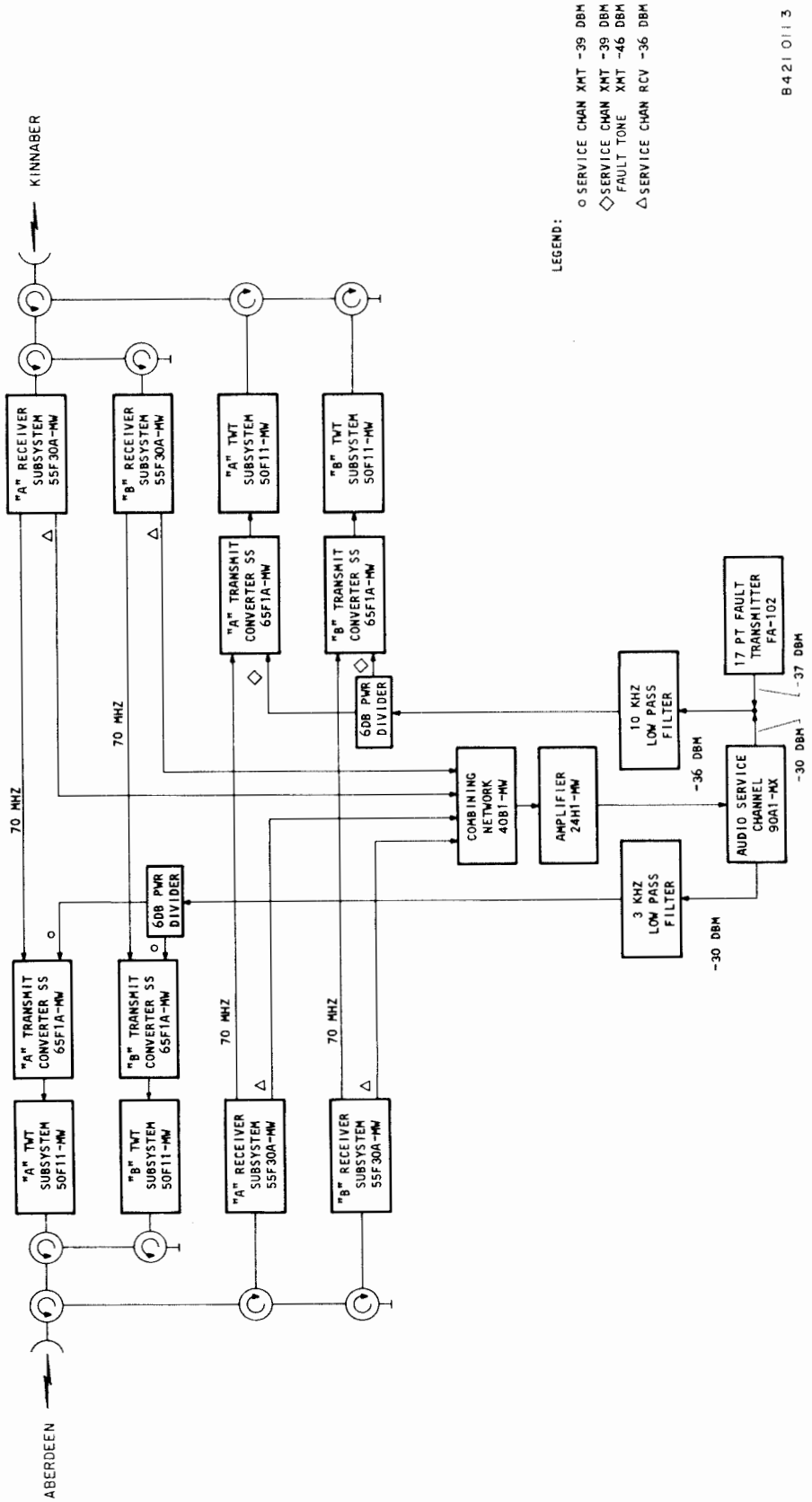

Figure 4-6. Inverbervie Station Block Diagram

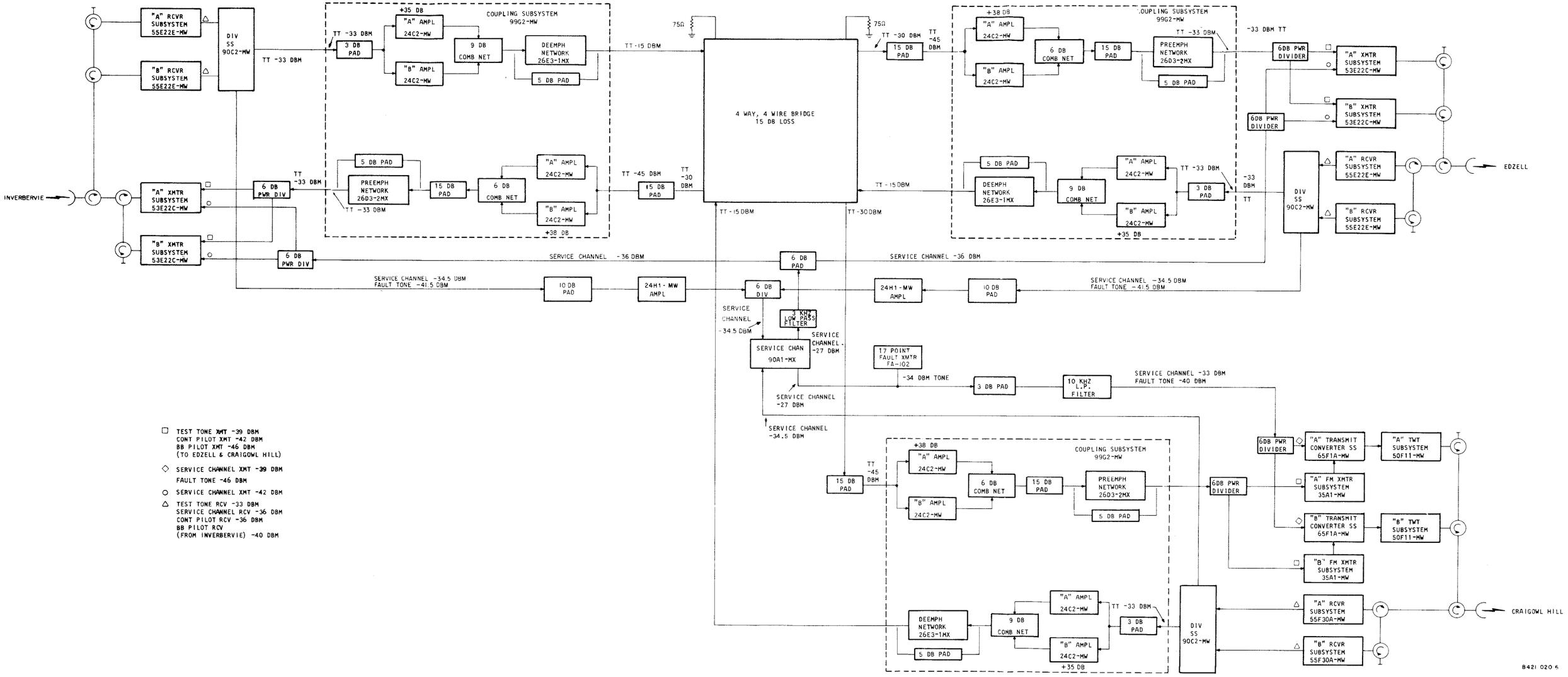

Figure 4-7. Kinnaber Station Block Diagram

transmitter subsystems. These subsystems convert the baseband signals to 70 MHz. This if. signal is coupled to the transmit converter subsystems for conversion to microwave frequencies. Like Aberdeen, the twt power amplifier subsystems boost the low powered microwave signals to 5 watts for transmission to Craigowl Hill.

At the Kinnaber station, the audio service channel receives information from all three adjacent stations. In each case, the information comes from the diversity subsystem. One fault alarm transmitter is used at Kinnaber and, like all other stations, transmits the fault data in one direction only - toward the master control station at Londonderry.

Three 6-foot parabolic antennas are used at Kinnaber and are mounted on a 190-foot guyed tower. (For tower and antenna details, refer to the installation drawings.)

The dc power plant consists of two 100-ampere battery chargers/rectifiers, one counter emf cell, one low-voltage disconnect panel, a deluge shower, and a 980-ampere-hour battery bank. These units operate the same as those described for Latheron.

4.4.7 EDZELL STATION

The Edzell station is configured as a remodulating terminal using Collins MW-508D radio equipment and a 99G2-MW Coupling Subsystem to interface with the AN/UCC-4 multiplex equipment. (See figure 4-8 for a block diagram of the Edzell station.)

The Edzell station has 12 multiplex channels to communicate with Londonderry. These channels are assigned to Supergroup 2, Basegroup 4. The voice frequency signal flow at this station is the same as that described for Thurso. (Refer to drawing 607-1962 in section 5 of this manual.)

The functional operation of the coupling subsystem and the rf equipment is the same as that described for the Thurso station. The fault alarm information is transmitted to the master control station via the 3-way junction repeater at Kinnaber.

One 6-foot parabolic antenna is used at Edzell and is mounted on an 80-foot self-supporting tower. (For antenna and tower details, refer to the installation drawings.)

One transportable shelter is supplied at Edzell and houses the rf equipment, the multiplex equipment, and the dc power plant. The shelter is 20 feet long by 8 feet wide by 8 feet high and is a modified S-280 type of shelter. The dc power plant consists of two battery chargers/rectifiers, one counter emf cell, one low-voltage disconnect panel, a deluge shower, and a 240-ampere-hour battery bank. The operation of this power plant is the same as that described for Latheron. Emergency power is supplied by the Navy.

4.4.8 CRAIGOWL HILL STATION

The Craigowl Hill station is configured as a heterodyne repeater using Collins MW-509E radio equipment. The station is between Kinnaber and East Lomond. (See figure 4-9 for a block diagram of the Craigowl Hill station.)

The functional operation of the rf, service channel, and fault alarm equipment is the same as that described for Aberdeen. Two 6-foot parabolic antennas are used at Craigowl Hill and are mounted on a 20-foot self-supported wooden tower. (For tower and antenna details, refer to the installation drawings.)

Two transportable shelters are provided at Craigowl Hill and are equipped the same as the shelters at Aberdeen. The dc power plant and the engine-generator are also the same as at Aberdeen.

4.4.9 EAST LOMOND STATION

The East Lomond station is arranged as a heterodyne repeater using Collins MW-509E radio equipment. The station is between Craigowl Hill and Kirk O'Shotts. (See figure 4-10 for a block diagram of the East Lomond station.)

The functional operation of the rf, service channel, and fault alarm equipment is the same as that described for Aberdeen. Two 6-foot parabolic antennas are used at East Lomond and are mounted on a 60-foot self-supported tower. (For tower and antenna details, refer to the installation drawings.)

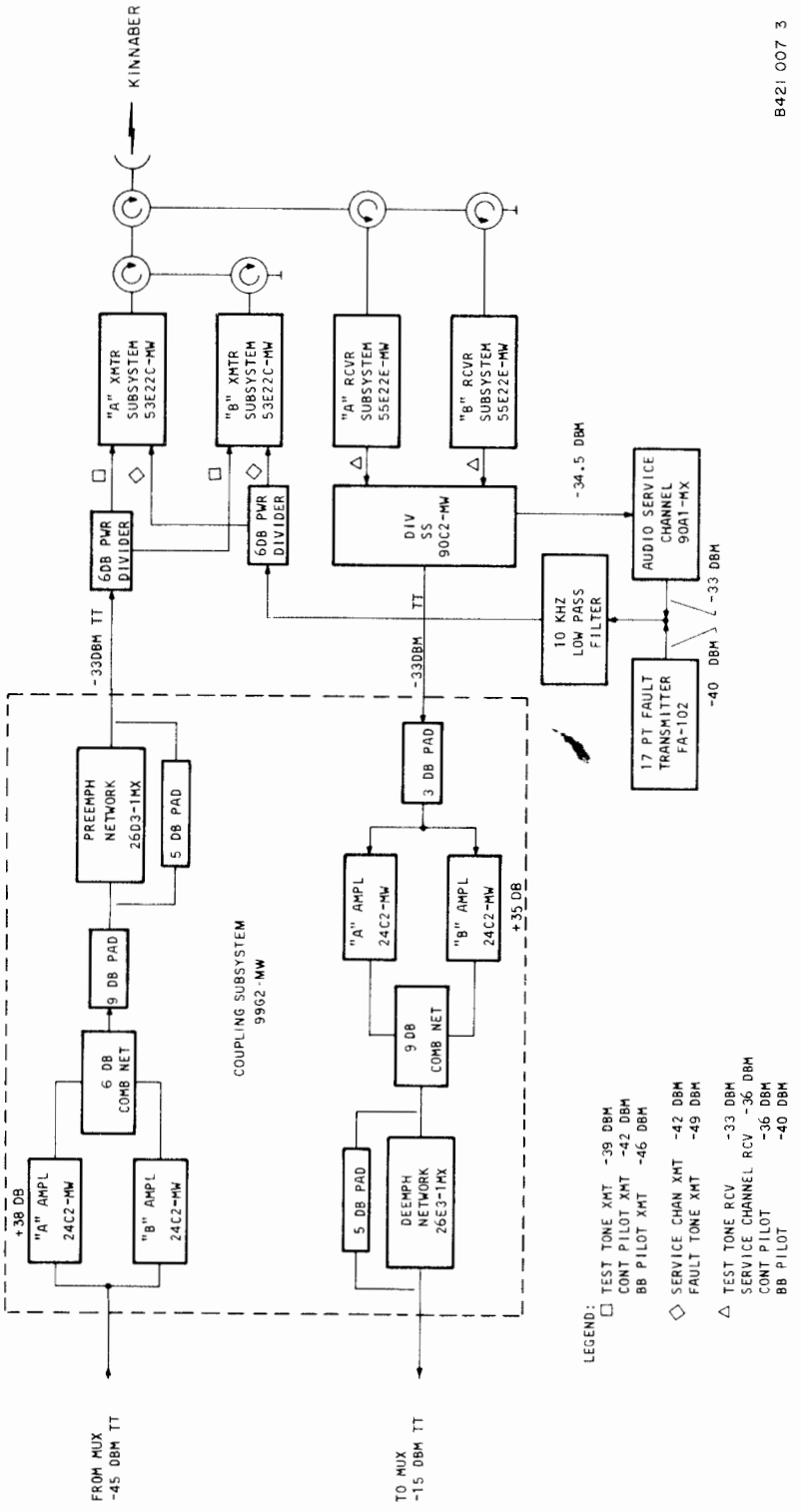

Figure 4-8. Edzell Station Block Diagram

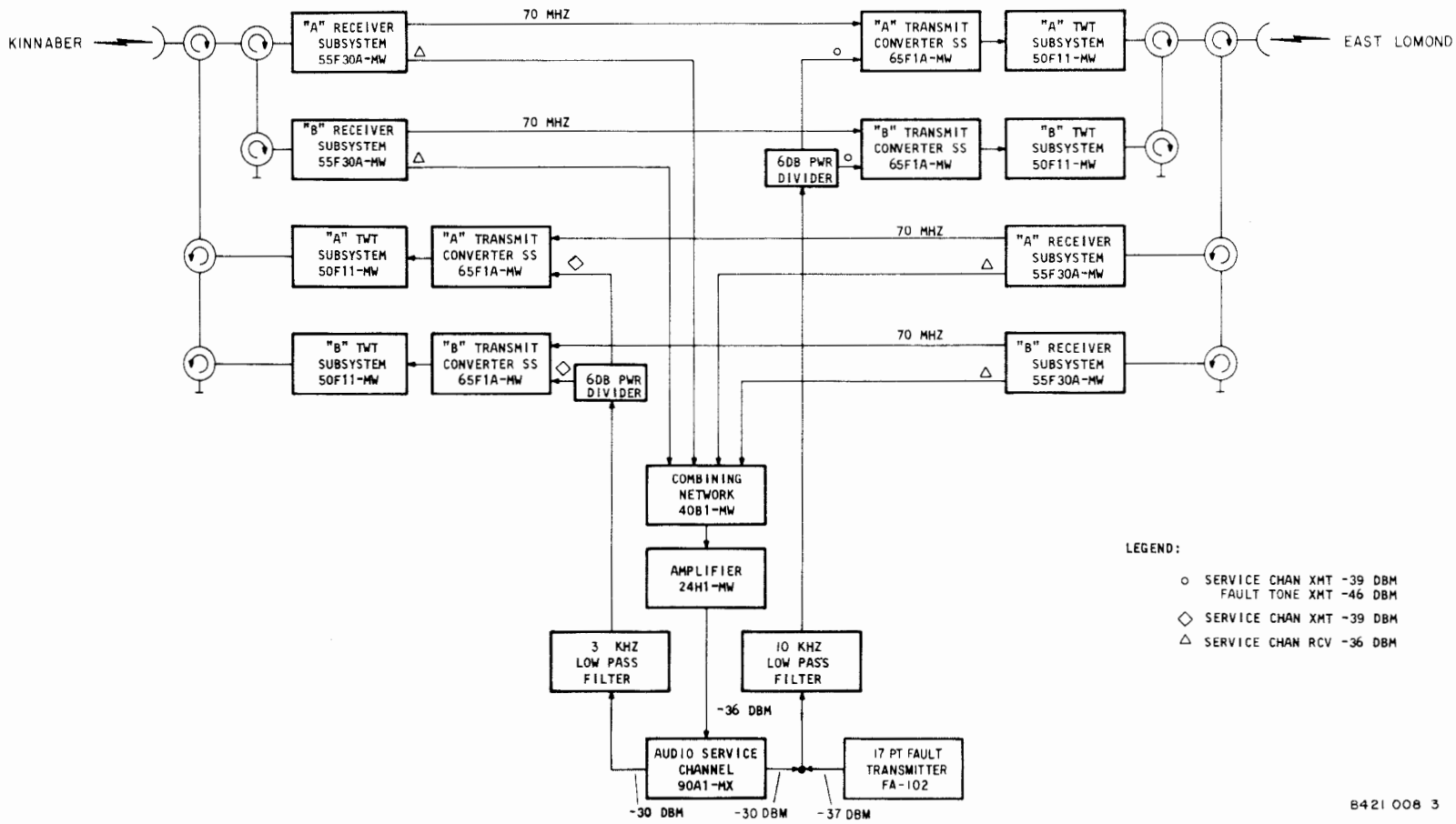

Figure 4-9. Craigowl Hill Station Block Diagram

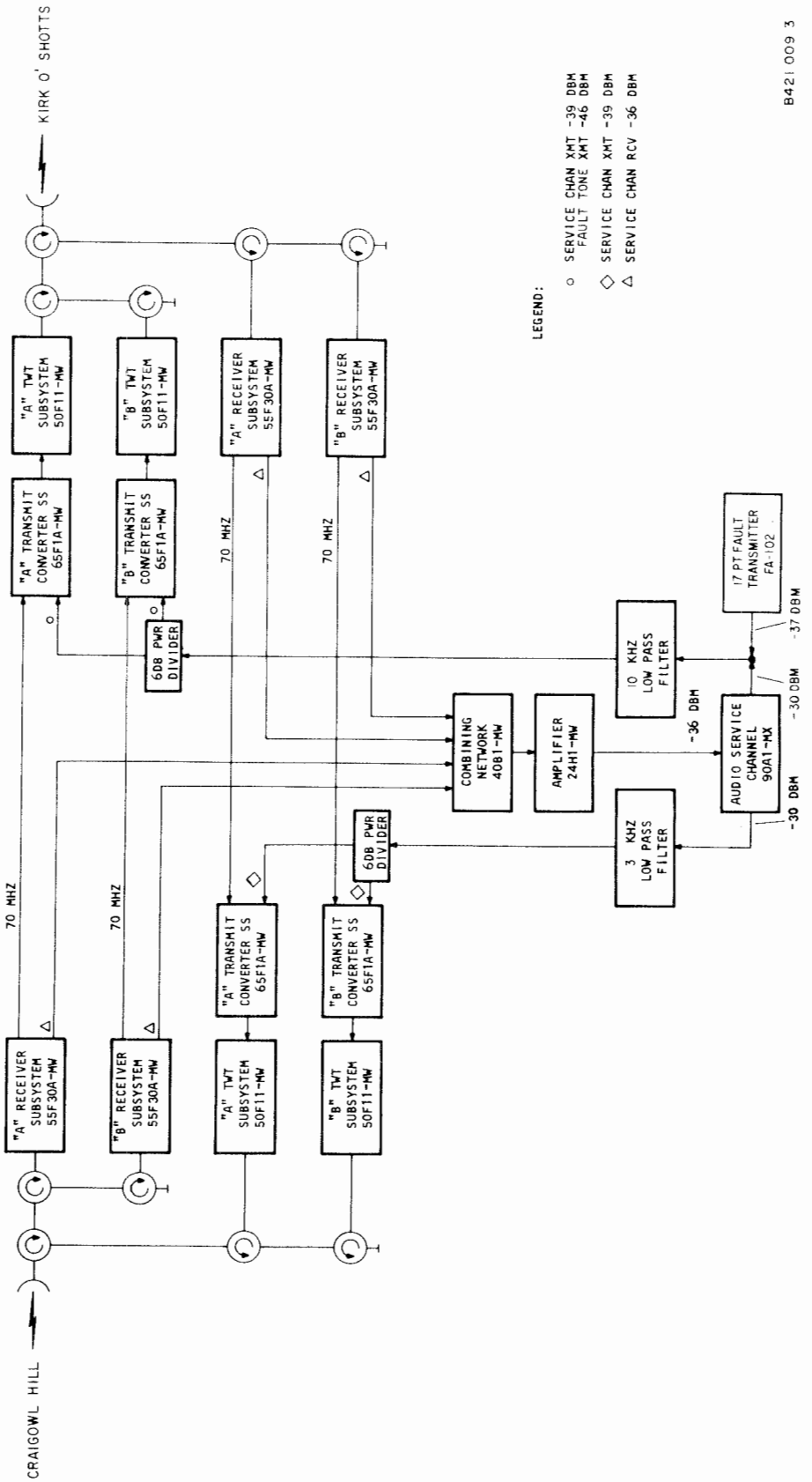

Figure 4-10. East Lomond Station Block Diagram

Two transportable shelters are provided at East Lomond and are equipped the same as the shelters at Aberdeen. The dc power plant and the engine-generator are also the same as at Aberdeen.

4.4.10 KIRK O'SHOTTS STATION

The Kirk O'Shotts station is configured as a heterodyne repeater. The station is between East Lomond and Sergeant Law. (See figure 4-11 for a block diagram of the Kirk O'Shotts station.)

This station is the same as that described for Craigowl Hill and Aberdeen except that the two 6-foot antennas are mounted on a 100-foot self-supported tower.

4.4.11 SERGEANT LAW STATION

The Sergeant Law station is another heterodyne repeater and is between Kirk O'Shotts and Brown Carrick. (See figure 4-12 for a station block diagram.)

This station is the same as that described for Craigowl Hill and Aberdeen except that the two 6-foot antennas are mounted on a 150-foot self-supported tower.

4.4.12 BROWN CARRICK STATION

The Brown Carrick station is configured as a repeater station and is the southernmost station in Scotland. This station is between Sergeant Law and Slieveanorra in northern Ireland, and uses Collins MW-509E radio equipment and 90E2-MW (MOD) 1:1 IF. Switch Subsystems. (See figure 4-13 for the station block diagram.)

The rf channels from Sergeant Law are received by the dual receivers, transformed into 70-MHz outputs, and inserted into the corresponding transmit converter subsystems. The transmit converters heterodyne the if. signals to microwave frequencies and couple the resultant signals to the twt power amplifier. The twt power amplifiers boost the power to 5 watts for the over-water hop (approximately 64 miles) to Slieveanorra. Because interrelated fading characteristics exist over this long hop, a quadruple-diversity arrangement is necessary. In this arrangement, two rf signals of different frequencies are transmitted from the highest antenna and are received on two antennas that are separated vertically by many wavelengths. This method of transmission takes advantage of the fact that simultaneous fading is unlikely over two separate line-of-sight paths, and is even more unlikely when two separate frequencies are used.

The signals from Slieveanorra are received by four separate receiver subsystems (two per frequency). One if. switch subsystem is used for each set of two receivers. The best two out of seven 70-MHz signals are selected as the if. switch outputs. These two 70-MHz signals are then inserted into the corresponding transmit converters and twt power amplifiers for transmission to Sergeant Law. The auxiliary baseband outputs from the receivers are combined and applied to the audio service channel. The output from the service channel is applied to all four transmit converters, while the fault alarm data is applied only to the transmit converters that transmit toward the master control station.

Three parabolic antennas are used at Brown Carrick and are mounted on a 130-foot self-supporting tower. A 6-foot antenna is used for the Brown Carrick-Sergeant Law link, and two 12-foot antennas are used for the Brown Carrick-Slieveanorra link. On the 6-foot antenna, two twt power amplifier subsystems and two receiver subsystems are connected using circulators and elliptical waveguide. The higher 12-foot antenna has two twt power amplifier subsystems and two receiver subsystems connected to it, and the lower 12-foot antenna has only two receiver subsystems. (For tower and antenna details, refer to the installation drawings.)

Two transportable shelters are provided at Brown Carrick. The radio equipment and the dc power plant are in one shelter and the emergency engine-generator in the other. The shelters are the same as those previously described for the Latheron station. The dc power plant and the engine-generator are the same as at Latheron.

4.4.13 SLIEVEANORRA STATION

The Slieveanorra station is arranged as a heterodyne repeater and is near the east coast of northern Ireland. This station is between Brown Carrick in Scotland and Dungiven, and uses Collins MW-509E radio equipment and 90E2-MW 1:1 IF. Switch Subsystems. (See figure 4-14 for a block diagram of the Slieveanorra station.)

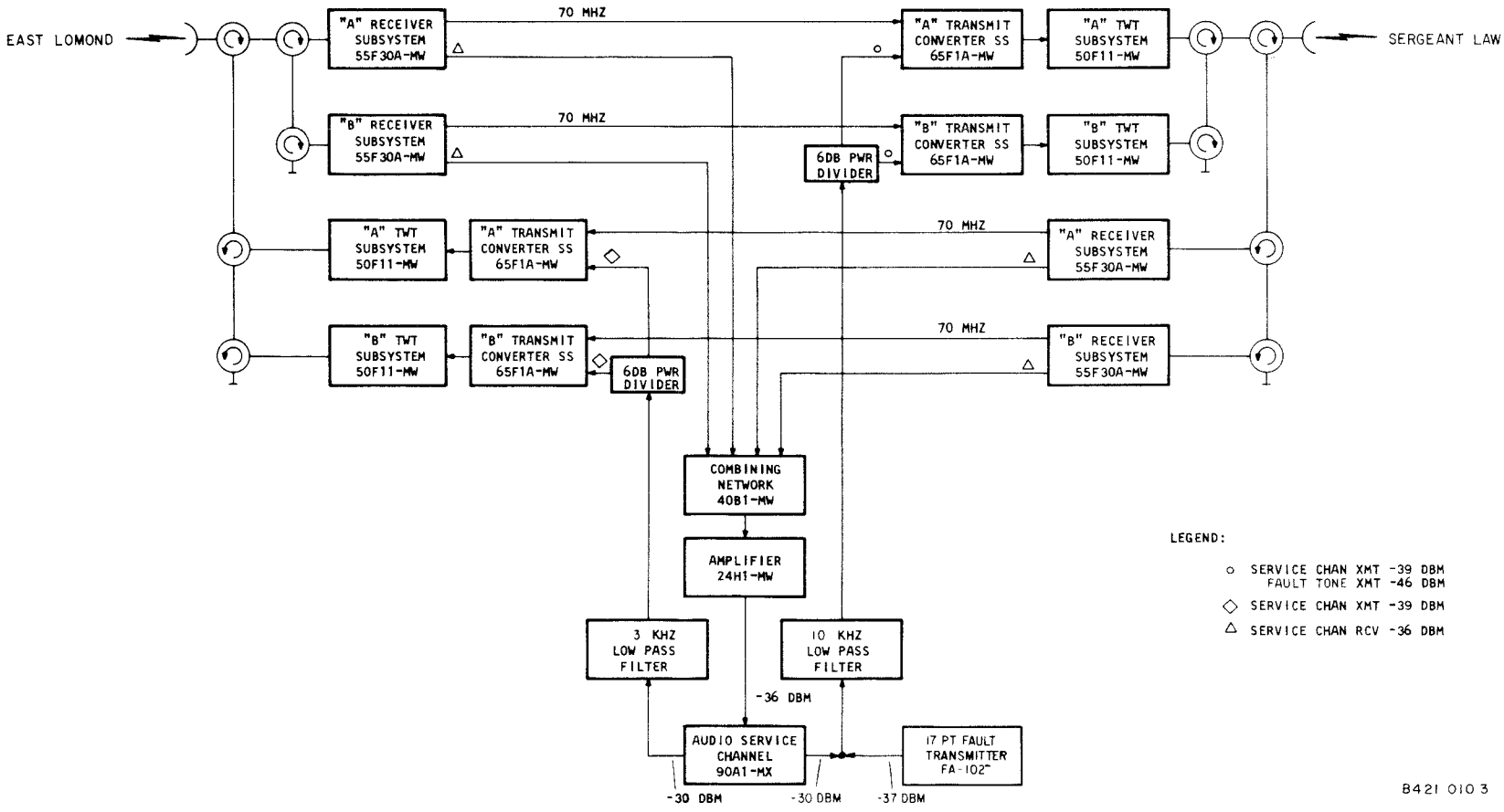

Figure 4-11. Kirk O'Shotts Station Block Diagram

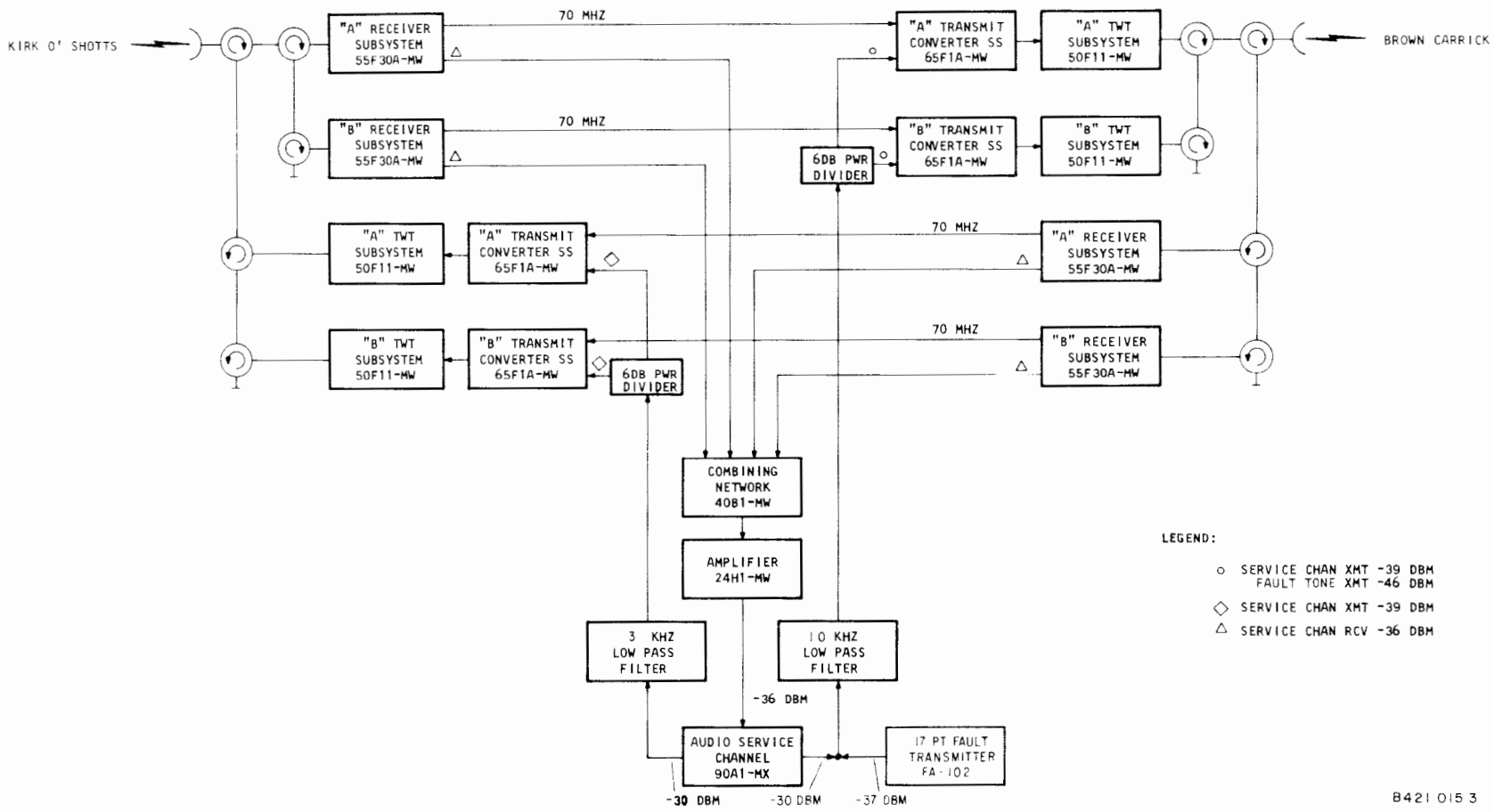

Figure 4-12. Sergeant Law Station Block Diagram

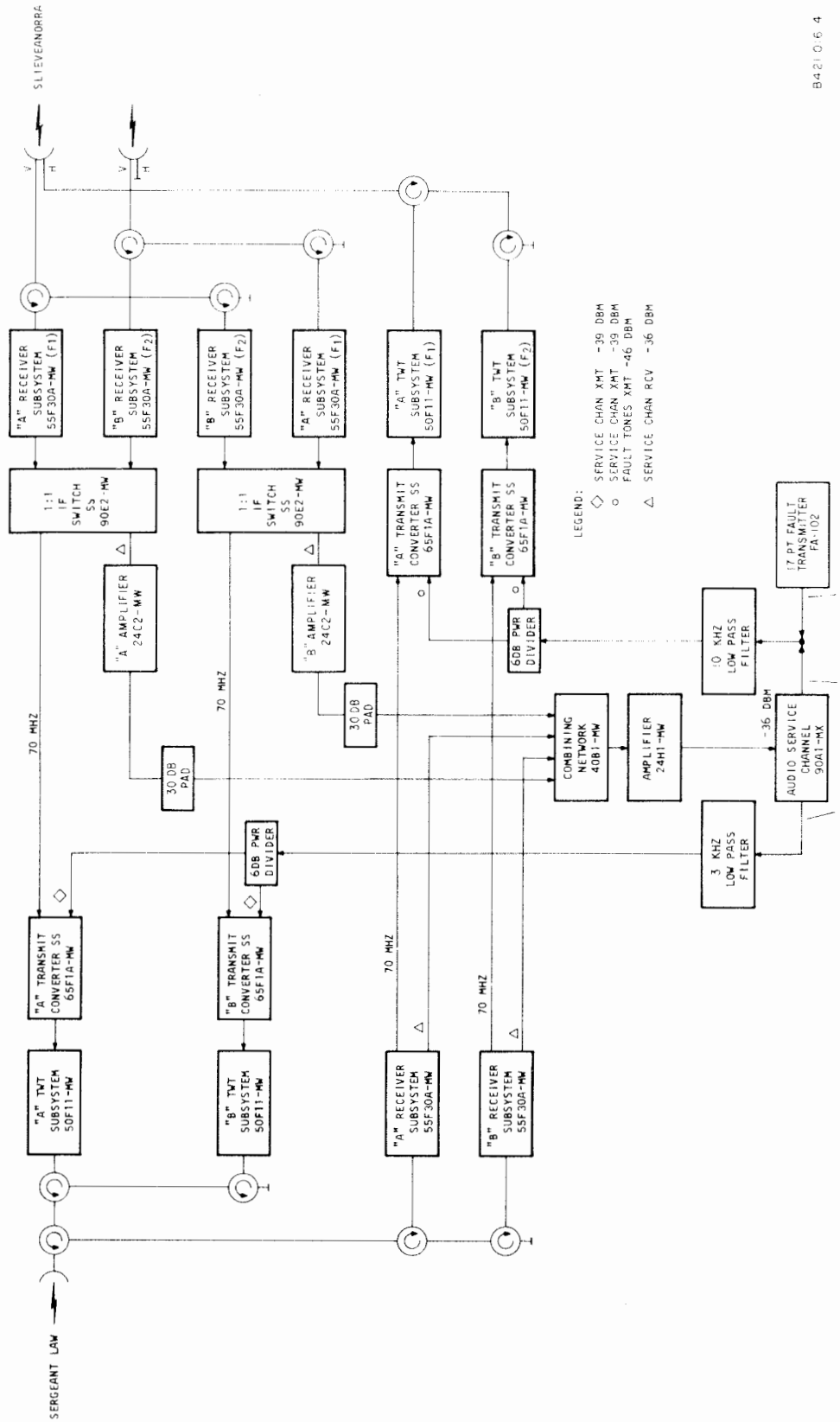

Figure 4-13. Brown Carrick Station Block Diagram

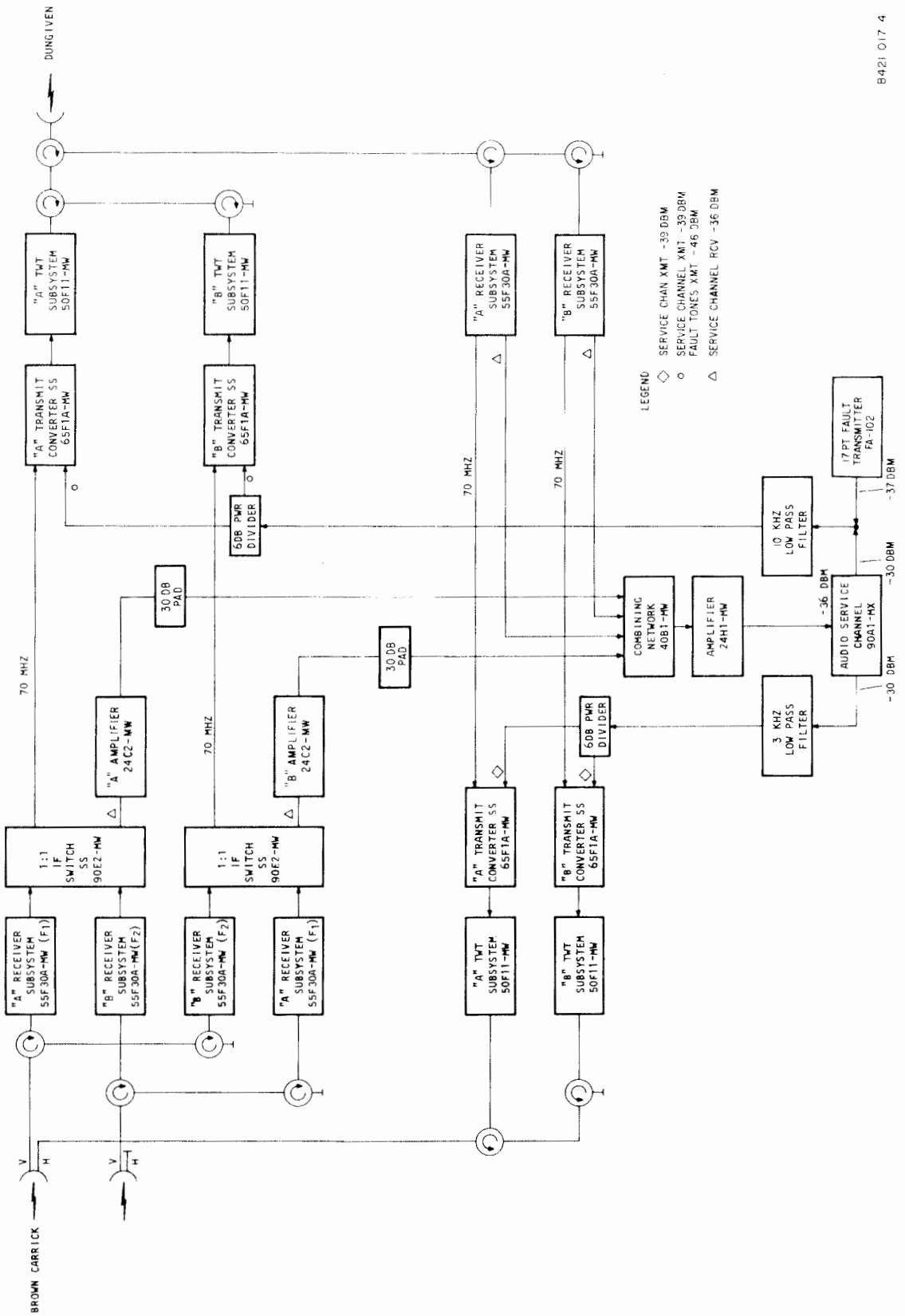

Figure 4-14. Slieveanorra Station Block Diagram

The functional operation of the rf and if. switch equipment is the same as that described for the Brown Carrick station except in reverse order. Quad-diversity is used for the over-water hop to Brown Carrick and frequency diversity is used for the hop to Dungiven. The fault alarm data, like at all other stations described, is transmitted towards the master control station.

Three antennas are used at Slieveanorra and are mounted on a 70-foot self-supported tower. A 6-foot antenna is used for the Slieveanorra-Dungiven link and two 12-foot antennas are used for the Slieveanorra-Brown Carrick link. On the 6-foot antenna, two twt power amplifier subsystems and two receiver subsystems are connected using circulators and elliptical waveguide. The higher 12-foot antenna has two twt power amplifier subsystems and two receiver subsystems connected to it, and the lower 12-foot antenna has only two receiver subsystems. (For tower and antenna details, refer to the installation drawings.)

Two transportable shelters are provided at Slieveanorra. The radio equipment and the dc power plant are in one shelter and the emergency engine-generator in the other. The shelters are the same as those previously described for the Latheron station. The dc power plant and the engine-generator are also the same as at Latheron.

4.4.14 DUNGIVEN STATION

The Dungiven station is configured as a heterodyne terminal using Collins MW-509E radio equipment, a 4-way, 4-wire bridge, and 99G2-MW Coupling subsystems to interface with AN/UCC-4 multiplex equipment. In normal operation, this station actually operates as a repeater station with multiplex drops. (See figure 4-15 for a block diagram of the Dungiven station.)

The signals from Slieveanorra are received by the dual receiver subsystems, which demodulate the signals to the baseband level. The outputs of the receivers are then combined by the diversity subsystem to produce a single signal that has a better signal-to-noise ratio than either received signal. While the service channel information is routed to the audio service channel, the primary baseband information is applied to the coupling subsystem. This coupling subsystem applies deemphasis and level and impedance matching to the signal before applying the baseband to the 4-way 4-wire bridge. The bridging network routes the signals from Slieveanorra to the coupling subsystem that interfaces with an existing frequency diversity heterodyne microwave system. This coupling subsystem provides the necessary preemphasis and level and impedance matching to the signals being transmitted to Londonderry.

The signals from Londonderry (via the existing microwave link) for Edzell, Thurso, or the Air Force interconnect at Mormond Hill are routed through the Dungiven station in the reverse order. The signals from Londonderry to Dungiven are routed through the coupling subsystem that interfaces with the existing microwave system, the 4-way bridging network, and another coupling subsystem to the AN/UCC-4 multiplex equipment. The channels from Dungiven to Londonderry are routed in the reverse order.

Dungiven is equipped with 48 multiplex channels, which are assigned to Supergroup 3, Basegroups 2, 3, 4 and 5. Basegroups 2, 3, and 4 are receive-only channels from Londonderry. Basegroup 5 is a full-duplex channel. If the existing microwave link between Dungiven and Londonderry should fail, a Supergroup 2 modulator/demodulator shelf can be patched into an existing basegroup for partial restoration of the system. For example, if the Dungiven-Londonderry link fails, 12 channels can be patched into Basegroup 4 or 5 to pick up the 12 Edzell or Thurso channels.

For the signal flow of the voice frequencies, refer to drawing 610-5753 in section 5 of this manual. The voice frequency circuits from the multiplex equipment are routed to the vf patch bay via the combined distribution frame (CDF). The vf patch bay provides testing and patching capabilities at +7-dBm receive and -16-dBm transmit levels. From the vf patch bay, the circuits are routed to the line conditioning pads within the sf rack via the CDF and the pin block assembly. The conditioning pads convert the +7/-16 dBm levels to 0/0 dBm levels. From the pads, the circuits are routed to the circuit patch bay via the pin block assembly and the CDF. The circuit patch bay provides testing and patching capabilities for the voice circuits at O-dBm transmit and O-dBm receive levels. From the circuit patch bay, the circuits are routed and terminated at the CDF to allow interface with telephone lines, tty, etc.

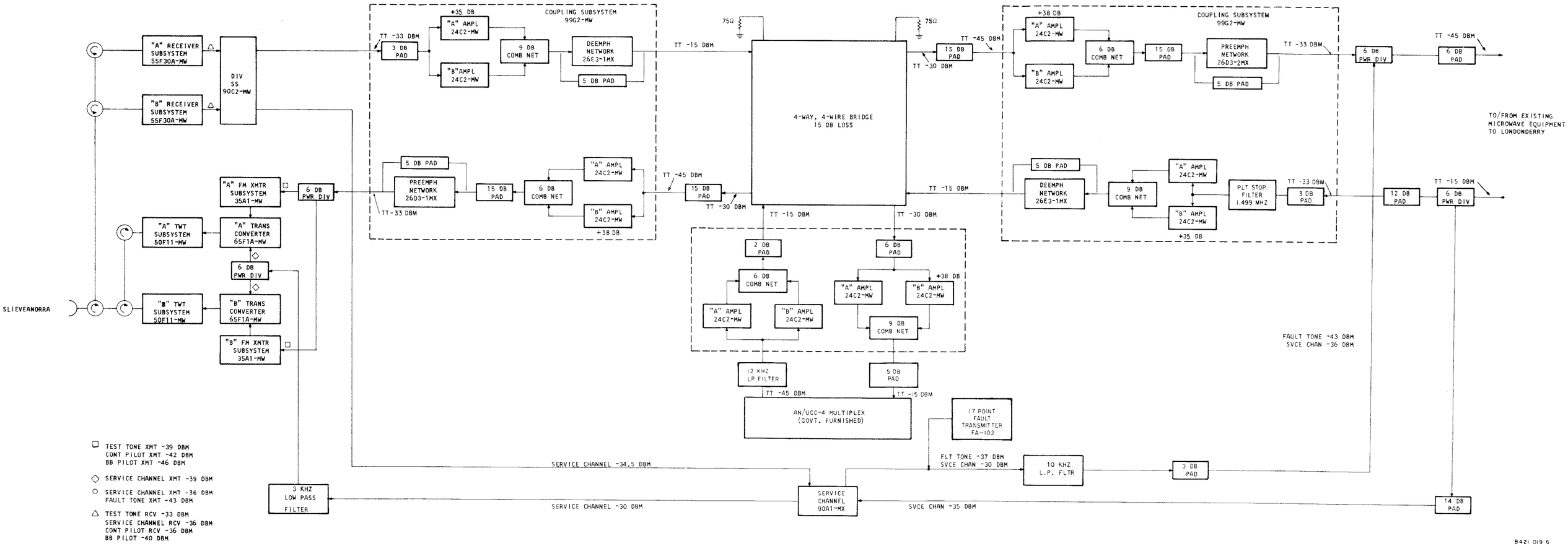

Figure 4-15. Dungiven Station Block Diagram

One 6-foot antenna is supplied at Dungiven. The two twt power amplifier subsystems and the two receiver subsystems are connected to this antenna through circulators and elliptical waveguide. Like all other stations, Dungiven has an existing automatic dehydrator that provides waveguide pressurization. The antenna is mounted on an existing 200-foot self-supporting tower. (For antenna details, refer to the installation drawings.)

The radio equipment is installed in an existing TC-1 van and the dc power plant is in an existing dc power shelter. The dc power plant equipment is the same as that described for Latheron except for a 420-ampere-hour battery bank. Emergency ac power is furnished by the Navy.

Note that the fault alarm data at this station, like at all previous stations, is transmitted towards the master control station (Londonderry).

4.4.15 LONDONDERRY STATION

The Londonderry station is an existing station in northern Ireland and serves as the master control station in the Ada-Beth-Cindy Microwave Communications System. This station is connected with Dungiven with an existing microwave system. As part of the Ada-Beth-Cindy system, government-furnished AN/UCC-4 multiplex equipment and Collins fault alarm equipment is installed. (See figure 4-16 for a block diagram of the Londonderry station.)

Londonderry is the primary station in this communication system. All channels transmitted by Thurso, the Air Force interconnect at Mormond Hill, Edzell, and Dungiven are terminated here. This station is equipped with 96 channels, of which 48 are in Supergroup 3 and 48 others are in Supergroup 2. In Supergroup 3, Basegroup 2, 3, and 4 are transmit-only channels to Dungiven. Basegroup 5 is a full-duplex channel with Dungiven. In Supergroup 2, Basegroups 1 and 2 interconnect with an existing Air Force microwave system at Mormond Hill. Basegroup 4 connects with Edzell and Basegroup 5 connects with Thurso.

The signal flow of the voice frequencies from the multiplex equipment to the individual voice circuits is the same at Londonderry as that described for Thurso. (Refer to drawing 607-1962 in section 5 of this manual.)

Londonderry is the master control station for the FA-102 fault alarm reporting system. Each of the other 14 stations only have a data transmitter while this station has the fault alarm receiver set. When a failure occurs at one of the remote stations, that station transmits a tone burst of a specific frequency. This tone burst is detected by the tone receiver assigned that frequency and causes a lamp to light on the fault alarm control panel. Each STATION REPORTING lamp corresponds to a particular station. The STATION SELECT switch must then be rotated until the corresponding STATION SELECT lamp is lighted. The fault data is then applied to the data receiver and displayed. On the data receiver, any of the faults monitored may be selected as a major alarm by setting the ALARM switch on the data indicator for the selected fault to the on position. Thus, when a selected major fault occurs at a remote station, that fault causes an audible alarm to sound, alerting the maintenance personnel. In addition to monitoring for major alarms, the major alarm and local indicator panel also displays any alarms that may occur at the local (Londonderry) station.

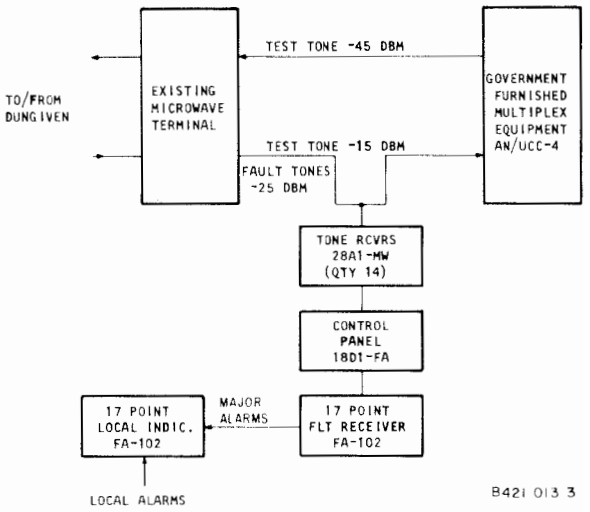

Figure 4-16. Londonderry Station Block Diagram

No antennas, towers, dc power plant, or emergency ac engine-generator are supplied because Londonderry is an existing station and these items are already installed and operating.

4.5 TEST DATA

4.5.1 SYSTEM/STATION TESTS

Test procedures for the overall system and for station-to-station alignment are included in section 5 of this manual. Because these tests are primarily for corrective maintenance, they are not included in this section. Tests for the individual subsystems are contained in the commercial technical manuals.

4.5.2 TROUBLESHOOTING GUIDE

4.5.2.1 TROUBLESHOOTING AT ALL REMOTE STATIONS

Troubleshooting at a remote station is limited to observation of the fault alarm data transmitter display to determine the type of fault. The type of fault occurring at a station will be indicated by a lighted red alarm lamp on one of the numbered register and data indicators. Indicator numbers and type of fault occurring are shown in table 4-1. Observation of the faulty subsystem indicators and operation of the various controls listed in tables 3-2 through 3-14 on the faulty subsystem front panels will indicate the faulty unit or circuit in the subsystem. Once the trouble has been isolated to a unit or circuit, refer to the appropriate NAVELEX manual for test and alignment procedures.

4.5.2.2 TROUBLESHOOTING AT MASTER CONTROL STATION (LONDONDERRY)

System troubleshooting is done at the master control station by use of the display on the data receiver. The fault alarm system operates at frequencies between 5 and 10 kHz and each remote station transmits up to 17 fault conditions to this station. The data transmitters at the remote stations each operate on an individually assigned frequency (table 4-2). A separate tone detector is used at the master control station for each remote station. When a fault is received from a remote station, the appropriate tone detector is activated, which in turn, lights a lamp on the fault alarm control panel. A rotary switch on the control panel then must be turned to the station reporting the alarm, thus applying the fault information to the data receiver. The faults are displayed on the data receiver in the same order as shown in table 4-1.

A systematic approach must be taken to properly identify the faulty station. For example, if an "A" RCV alarm is received from Craigowl Hill and an "A" XMT alarm is received from East Lomond, the "A" transmitter at East Lomond most likely failed rather than the "A" receiver at Craigowl Hill. Again, if an AC PWR alarm and a momentary DC PWR alarm is received from a remote station, most likely the commercial ac has failed and the emergency engine-generator has turned on. On the other hand, if both the AC PWR and DC PWR alarms are continuously received, the ac power probably failed and the engine-generator failed to turn on. In this case, the engine-generator failure would be verified by an ENG-GEN alarm.

Locally, the Londonderry station alarms are monitored at the major alarm and local indicator subsystem. Since the fault alarms displayed are generated locally, the cause of the alarms is easily detected and isolated. The faults displayed on the local indicator are listed in table 4-3.

In all cases, the audible alarm will remain on for any selected local or remote alarm until that fault is corrected. The audible alarm can be disabled by setting the NORMAL/DISABLE switch on the audible alarm panel to DISABLE. This setting is for maintenance personnel convenience only and must be returned to the NORMAL position after corrective maintenance is performed. Refer to drawing 610-4314 in section 5 for details of the alarm system at Londonderry.

4.5.3 BLOCK AND LEVEL DIAGRAMS

The signal flow, power distribution, and alarm distribution block and level diagrams in section 5 are not only aids to the maintenance tests, but also serve as servicing and troubleshooting diagrams. When these diagrams are used in conjunction with the fault alarm system, the maintenance technician should be able to localize a trouble to the faulty subsystem, and in most cases, to the faulty module. For specific information on maintenance and troubleshooting a particular subsystem, refer to the appropriate commercial technical manual (listed in the introduction to this manual).

For easy access, the drawings in section 5 are arranged as much as possible by station. For reference, the drawing numbers of the block and level diagrams are listed in table 4-4.

TABLE 4-1. FAULT CONDITIONS MONITORED

FAULT NO.	FAULT DESIGNATION	FAULT NAME	SOURCE OF FAULT ALARM
1	"A" XMT	"A" transmitter	Low transmitter output; transmitter off-frequency or possible failure of standby equipment for "A" transmitter subsystems
2	"B" XMT	"B" transmitter	Same as above except for "B" transmitter subsystems
3	"A" RCV	"A" receiver	Low receiver output: high received noise on "A" rf channel; no received rf signal; insert amplifier failure; possible failure of standby equipment for "A" receiver subsystems
4	"B" RCV	"B" receiver	Same as above except for "B" receiver subsystems
5	N "A" COMB/SW	"A" diversity combiner/ if. switch, North	High received noise on "A" rf channel; low receiver output; combiner or if. switch failure; loss of radio pilot; standby equipment failure
6	N "B" COMB/SW	"B" diversity combiner/ if. switch, North	Same as above except for "B" rf channel
7	S "A" COMB/SW	"A" diversity combiner/if. switch, South	Same as fault 5 except for South direction
8	S "B" COMB/SW	"B" diversity combiner/ if. switch, South	Same as fault 6 except for South direction

TABLE 4-1. (Continued)

FAULT NO.	FAULT DESIGNATION	FAULT NAME	SOURCE OF FAULT ALARM
9	MUX/CPLG	Multiplex major or minor alarm or coupling alarm	Multiplex failure of main or standby equipment; coupling subsystem failure
10	ENG-GEN	Engine-generator	Failure of engine-generator to start
11	AC PWR	Commercial ac power	Failure or excessive variations of commercial ac power (connected at battery charger ac fail alarm point)
12	DC PWR	Dc charger failure	Dc charger output failure (connected to charger HI-LO alarm point)
13	ENTRY ALM	Entry alarm	Indicates an open shelter door or open fence gate
14	W/G	Waveguide pressure	Compressor/dehydrator failure
15	ANT HEAT	Antenna heater failure	Failure of antenna heating elements, possibly due to loss of ac power
16	TWR. LIGHT	Tower lights	Failure of obstruction lights on tower
17	SHELT TEMP	Shelter temperature	Inside temperature of shelter is too high or too low

TABLE 4-2. FAULT ALARM TRANSMITTER FREQUENCIES

STATION	FREQUENCY (kHz)
Thurso	10.00
Latheron	9.03
Mormond Hill	8.18
Aberdeen	7.44
Inverbervie	6.80
Kinnaber	5.25
Edzell	6.06
Craigowl Hill	5.50
East Lomond	5.76
Kirk O'Shotts	6.41
Sergeant Law	7.11
Brown Carrick	7.88
Slieveanorra	8.59
Dungiven	9.50

TABLE 4-3. LOCAL FAULT CONDITIONS MONITORED — LONDONDERRY

FAULT NUMBER	FAULT DESIGNATION	FAULT NAME	SOURCE OF ALARM
1	"A" PWR OUT PHILCO TX	"A" power out Philco transmitter	Low transmitter output
2	"B" PWR OUT PHILCO TX	"B" power out Philco transmitter	Low transmitter output
3	"A" MOD LOSS	"A" modulator loss	Failure of modulator, lack of signal from modulator
4	"B" MOD LOSS	"B" modulator loss	Same as above except for "B" modulator
5	"A" AGC ALM	"A" agc alarm	Loss of or low received rf signal, "A" path
6	"B" AGC ALM	"B" agc alarm	Same as above except for "B" path
7	"A" PLT ALM	"A" pilot alarm	Loss of "A" path radio pilot
8	"B" PLT ALM	"B" pilot alarm	Loss of "B" path radio pilot
9	"A" NOISE ALM	"A" noise alarm	High received noise on "A" rf path
10	"B" NOISE ALM	"B" noise alarm	Same as above except for "B" rf path
11	FUSE ALM	Fuse alarm - Collins sf rack	Blown fuse due to faulty module in sf signaling rack
12	Blank		
13	MUX MINOR	Multiplex minor alarm	Failure of standby multiplex equipment
14	MUX MAJOR	Multiplex major alarm	Failure of main and standby multiplex equipment or failure of critical component
15	"A" BAT CHARGER	"A" battery charger	"A" battery charger failure or power loss
16	"B" BAT CHARGER	"B" battery charger	Same as above except for "B" charger
17	Blank		

TABLE 4-4. BLOCK AND LEVEL DIAGRAMS

STATION	RACK LAYOUT	SIGNAL FLOW	POWER DISTRIBUTION	ALARM DISTRIBUTION
Thurso	607-1856	607-1822	607-1985	607-1984
Latheron	607-1861	607-1824	607-1989	607-1988
Mormond Hill	607-1866	607-1826	607-1999	607-1998
Aberdeen	607-1871	607-1828	607-2029	607-2028
Inverbervie	607-1876	607-1830	607-2031	607-2030
Kinnaber	607-1881	607-1832	607-2061	607-2060
Edzell	607-1886	607-1834	607-1987	607-1986
Craigowl Hill	607-1891	607-1836	607-2027	607-2026
East Lomond	607-1896	607-1838	607-2025	607-2024
Kirk O'Shotts	607-1901	607-1840	607-2023	607-2022
Sergeant Law	607-1906	607-1842	607-2021	607-2000
Brown Carrick	607-1911	607-1844	607-2153	607-2154
Slieveanorra	607-1916	607-1846	607-2155	607-2156
Dungiven	607-1921	607-1848	607-2109	607-2110
Londonderry	610-4305	610-4314	610-4320	610-5734

ALPHABETICAL INDEX

ALPHABETICAL INDEX (Cont)

ALPHABETICAL INDEX (Cont)

ALPHABETICAL INDEX (Cont)

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