FIELD APPLICATIONS OF TE-1 AND TE-2 RADIO EQUIPMENT DESIGN REQUIREMENTS RADIO SYSTEMS

1. GENERAL

Scope

1.01 This specification together with the supplementary information listed herein covers the equipment design requirements of typical TE radio arrangements. Supplementary information is listed covering mechanical, electrical, and transmission factors to provide a guide for selecting material for TE applications.

1.02 This specification is reissued to incorporate previous appendix changes.

Description

1.03 The type TE radio system, either TE-1 or TE-2, is a frequency-modulated microwave system in the 4000-megacycle range. It is used for one-way transmission of television signals over line-of-sight paths in such applications as relaying television video signals from originating studios to commercial television transmitting stations, pick-up to local offices, or as a radio link to extend wire or radio facilities. In addition to serving as a single link, point-to-point television channel, several sets of this equipment may be used in tandem to form a relay system of more than one jump. Dual-channel operation is possible over a single link or a multiple link system. Standard RMA black and white television signals are transmitted but the accompanying audio signals are not transmitted by the TE equipment. Paralleling facilities for the sound program and for order wire must be provided. Since the operating frequencies and method of modulation are the same, TE-1 transmitting equipment may work with TE-2 receiving equipment and vice versa. On dual-channel operation, paired band-pass filters are required in both the transmitting and receiving equipment, and the same filters are used with both the TE-1 and TE-2 equipments. Both the TE-1 and TE-2 radio systems may be modified per J41608—806-107-151, J41609 Mfr Disc., J41616 Mfr Disc., and J41617 Mfr. Disc. to permit them to carry NTSC color television signals as well as monochrome signals.

1.04 ***Separation of RF Equipment and Antenna:*** The TE equipment may be operated with the RF equipment close behind the antenna or with a considerable separation between the RF equipment and the antenna. To prevent incurring excessive transmission penalties when the transmitter RF equipment and antenna are separated, a radio amplifier and combinations of waveguide and coaxial cable have been made available. J41621 covers the TE-A1 radio amplifier; J68335, ED-45471-01, and ED-45472-01 cover the waveguide and coaxial cable arrangements; ED-45473-01 and ED-45474-01 cover bay layouts; while transmission considerations are covered in letters filed under AT&TCo Topical Index Code 183.4 Radio Engineering Data—Antennas and Transmission Lines. A waveguide isolator may also be employed when there is considerable separation between the TE transmitter RF equipment and the antenna.

1.05 TE equipment may be combined in various ways and with a number of different antennas. A summation of the various combinations of TE equipment that have been made available is covered by the following table:

	No Separation Between r.f. Equipment and Antenna		Separated r.f. Equipment and Antenna	
Type	*Antenna	Feature	*Antenna	Feature
TE-1	A, D	Trans. Single Channel See J41608	A, C, D	Trans. Single Channel See J41608, ED-45471-01, ED-45472-01
TE-1	D	Trans. Dual Channel See J41608	A, C, D	Trans. Dual Channel See J41608, ED-45471-01, ED-45472-01
TE-1	A, D	Receiving Single Channel See J41609	A, C, D	Receiving Single Channel See J41609, ED-45471-01, ED-45472-01
TE-1	D	Receiving Dual Channel See J41609	A, C, D	Receiving Dual Channel See J41609, ED-45471-01, ED-45472-01
TE-2	B	Trans. Single Channel See J41616	B, C, D	Trans. Single Channel With TE-A1 Radio Amplifier See J41616, ED-45471-01, ED-45472-01, ED-45473-01
TE-2			B, C, D	Trans. Dual Channel With TE-A1 Radio Amplifier See J41616, ED-45471-01, ED-45472-01, ED-45473-01
TE-2	B	Receiving Single Channel See J41617	B, C, D	Receiving Single Channel See J41617, ED-45471-01, ED-45472-01, ED-45473-01
TE-2			B, C, D	Receiving Dual Channel See J41617, ED-45471-01, ED-45472-01, ED-45473-01

*A KS-5708,L1 TE-1 Parabolic Antenna
B KS-5708,L2 or KS-5708,L2 and L3 TE-2 Parabolic Antenna
C KS-5759,L1 Shielded Lens Antenna
D KS-5706,L2 or L3 Shielded Lens Antenna

1.06 ***Antennas:*** Either shielded lens antennas or parabolic reflecting antennas may be used with TE equipment. Antenna selection and location depend on a balance among several factors such as path length, path clearance, signal-to-noise ratio permitted, interference possibilities, antenna supporting structure, etc. Portable towers of aluminum in various heights to 144 feet are available to support a parabolic antenna and associated r.f. unit as well as floor mounted frameworks. Antenna and antenna mounting arrangements for use with TE equipment are covered in J41610 while available towers are covered in J41618.

1.07 ***TE-A1 Radio Amplifier:*** The TE-A1 radio amplifier consists of a two stage amplifier used between a TE transmitter r.f. unit and an antenna to permit separating the two without incurring excessive transmission penalties. The necessary power supplies, air supply and mounting arrangements are integral with the amplifier. J41621 covers the ordering information for this unit and ED-45398-01 shows the equipment arrangement.

1.08 ***Waveguide Isolator:*** A waveguide isolator may be used when there is considerable separation between the TE transmitter RF equipment and the antenna. It is recommended that a Cascade Research Corporation isolator, Uniline 38-42WE, or its equivalent, be installed in the waveguide run, as close to the RF equipment as possible, whenever waveguide runs in excess of 5 feet are used. Refer to J41608—806-107-151 and J41616—Mfr Disc.

1.09 ***Type TE-1 Radio Transmitter Equipment:*** The type TE-1 radio transmitter equipment (J41608) consists of three basic components; video equipment in a floor supported cabinet, r.f. equipment mounted in a cabinet, and lastly a highly directive

antenna. The r.f. equipment may be directly connected to the antenna or separated from the antenna as covered in paragraph 1.04. A TE-A1 radio amplifier or a waveguide isolator may be used as indicated.

1.10 ***Type TE-1 Radio Receiver Equipment:*** The type TE-1 radio receiver equipment (J41609) consists of three basic components, namely: i.f. and video equipment in a floor supported cabinet, r.f. equipment mounted in a cabinet and a highly directive antenna. The r.f. equipment may be connected to the antenna or separated from it as covered in paragraph 1.04.

1.11 ***TE-2 Radio Transmitter Equipment:*** The TE-2 radio transmitter equipment (J41616) consists of three basic components; power and control equipment in a floor supported cabinet; radio frequency and video equipment mounted in a weatherproof unit which may be connected directly to a parabolic antenna or separated from the antenna as covered in paragraph 1.04; and a highly directive antenna which may be associated either with portable towers or floor supported frameworks. A TE-A1 radio amplifier or a waveguide isolator may be used with this equipment as indicated.

1.12 ***TE-2 Radio Receiver Equipment:*** The TE-2 radio receiver equipment (J41617) consists of four basic components namely: intermediate frequency (i.f.), video and control equipment in a floor supported cabinet; power equipment in a floor supported cabinet; r.f. and preliminary i.f. equipment mounted in a weatherproof unit which may be connected directly to a parabolic antenna or separated from the antenna as covered in paragraph 1.04; and a highly directive antenna which may be associated either with portable towers or floor supported frameworks.

1.13 ***AC Power:*** Transmitting equipment or receiving equipment for either TE-1 or TE-2 operates from a primary power source of 115-volt $\pm$10-volt, 60 cps, alternating current. The drain per channel is approximately 490 watts at 90 per cent power factor for the control and r.f. equipment. When used with a portable tower the azimuth and elevation motors which are connected to the same power source in the control cabinet require approximately 40 watts each at 90 per cent power factor and the tower lights require 600 watts at 100 per cent power factor. The TE-A1 radio amplifier operates also from 115-volts $\pm$10-volts and its drain is approximately 320 watts at 75 per cent power factor. In order to obtain reliability, consideration should be given to an adequate source of standby power.

1.14 ***Alarms:*** Office alarm equipment is not furnished as part of this equipment but provision is made in the equipment for connecting to office alarm circuits as required for no or low carrier alarms and for gas pressure alarms for use with waveguide runs. When the TE-A1 radio amplifier is used provision is made for connecting to alarm circuits to indicate when the power to the air pump motor is interrupted.

1.15 ***Cabling Arrangements:*** The various units are connected together by means of cables provided with screw-type connectors at both ends. However, video input, video output, and output monitoring cables and video patching arrangements, when required, must be provided by the customer.

1.16 ***Maintenance and Testing Equipment:*** Maintenance and testing equipment shall be furnished by the customer as required by reference to the ordering specifications for the particular equipment involved.

2. SUPPLEMENTARY INFORMATION

See list of supplementary information in specifications listed below.

806-000-000—Equipment Design and General Equipment Requirements and Engineering Information—Radio Systems and Television Systems
J41608—806-107-151—TE-T1 Radio Transmitter
J41609—Mfr Disc.—TE-R1 Radio Receiver
J41610—Mfr Disc.—Antennas for Microwave Transmission
J41616—Mfr Disc.—TE-T2 Radio Transmitter
J41617—Mfr Disc.—TE-R2 Radio Receiver
J68335—Mfr Disc.—Antenna Waveguide
J41618—Mfr Disc.—Portable Towers
J41621—Mfr Disc.—TE-A1 Radio Amplifier
BSP R10.240—Type TE-T1 Radio Transmitter
BSP R10.270—Type TE-T2 Radio Transmitter
BSP R20.300—Type TE-R1 Radio Receiver
BSP R20.350—Type TE-R2 Radio Receiver
BSP R40.210—Shielded Lens Microwave Antennas
BSP R40.220—Parabolic Reflector Microwave Antennas

BSP R90.210—Type TE Radio System
BSP R90.290—Type TE-2 Radio System

3. DRAWINGS

SD-45266-01—Application Schematic for Typical Field Installations
ED-45323-01—Power Cable
ED-45394-01—Cable Assembly
ED-45395-01—Flange Transformer
ED-45398-01—TE-A1 Radio Amplifier Equipment
ED-45465-01—Cable Assembly
ED-45466-01—Transducer (2.290 x 1.145 Waveguide)
ED-45467-01—Waveguide Transformer (1.872 x 0.872 Waveguide) (2.290 x 1.185 Waveguide)
ED-45468-01—3 db Attenuator (1.872 x 0.872 Waveguide)
ED-45469-01—Transducer (1.872 x 0.872 Waveguide)
ED-45471-01—Typical Office Plan
ED-45472-01—Typical Waveguide & Coaxial Cable Plan
ED-45473-01—TE-R2 Receiver Bay Equipment
ED-45474-01—TE-T2 Transmitter Bay Equipment
ED-45483-01—Receiver Frame Assembly

Bell Telephone Laboratories, Inc.

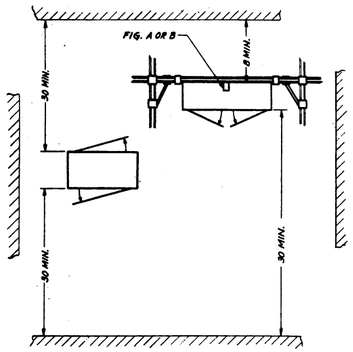
ED-45484-01—Transmitter Frame Assembly
ED-45485-01—Frame Assembly
ED-45486-01—Flexible Waveguide Assembly
ED-45487-01—Waveguide Spacers

4. EQUIPMENT

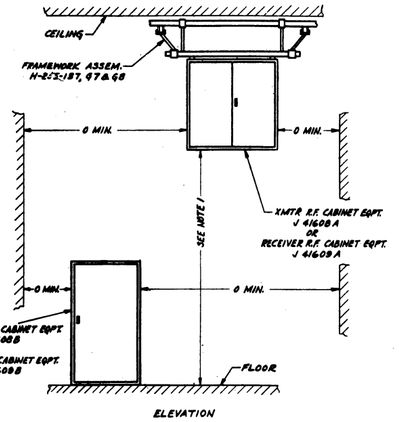
See respective specifications listed below for specific ordering information.

J41608—806-107-151—TE-1 Transmitting Equipment
J41609—Mfr Disc.—TE-1 Receiving Equipment
J41610—Mfr Disc.—TE-1 and TE-2 Antennas
J41616—Mfr Disc.—TE-2 Transmitting Equipment
J41617—Mfr Disc.—TE-2 Reciving Equipment
J41618—Mfr Disc.—Portable Towers for use With TE-2 Equipment
J41621—Mfr Disc.—TE-A1 Radio Amplifier

The above equipment may be used as covered in specific specifications and BSP's or as shown on the drawings listed in Part 3 provided due consideration is given to the transmission criteria contained in supplementary information and especially contained in the letters of paragraph 1.03.



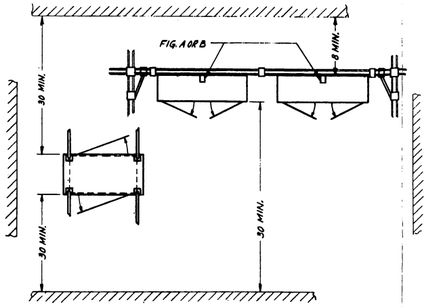
PLAN VIEW



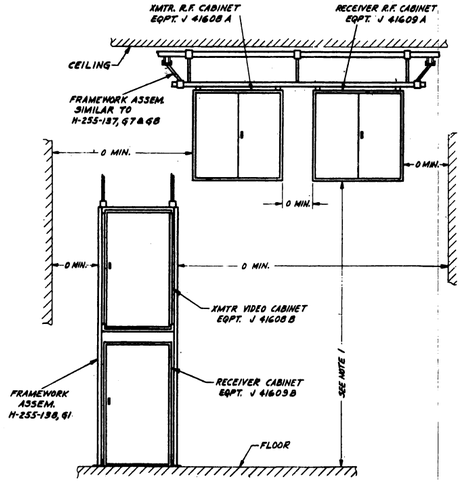
ELEVATION

TE-1 SINGLE CHANNEL
RECEIVER OR TRANSMITTER

FIG. 1

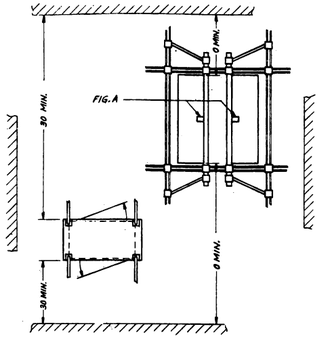


PLAN VIEW

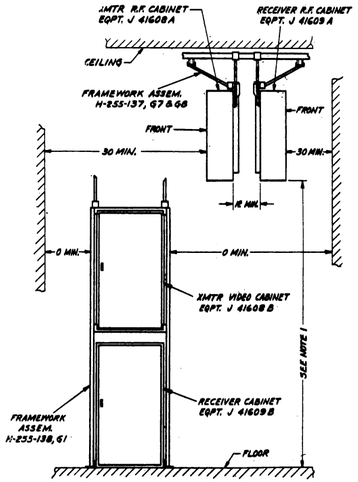


ELEVATION

R.F. CABINETS SIDE BY SIDE



PLAN VIEW

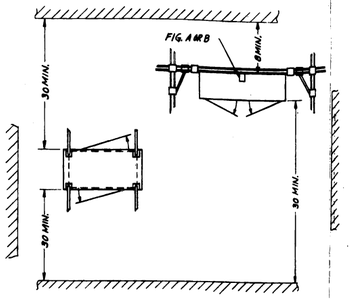


ELEVATION

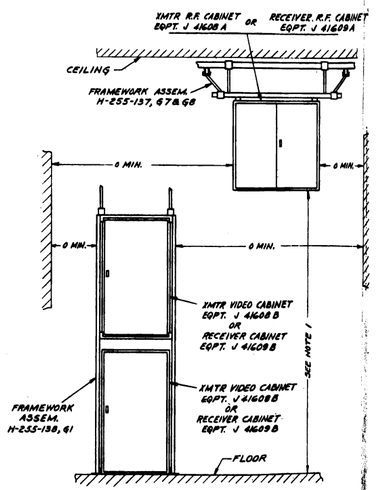
R.F. CABINETS BACK TO BACK

TE-1 SINGLE CHANNEL
REPEATER STATION

FIG. 2



PLAN VIEW

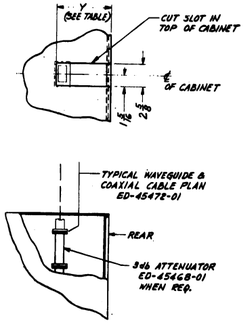


ELEVATION

TE-1 DUAL CHANNEL
RECEIVER OR TRANSMITTER

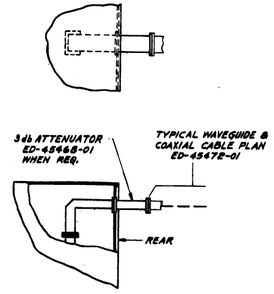
FIG. 3

CABINET	DIM. Y
XMTR R.F. CABINET EQPT. J-41608 A	3 3/8
RECEIVER R.F. CABINET EQPT. J-41609 A	6 3/8



WAVEGUIDE ENTERING THROUGH TOP OF CABINET

FIG. A



WAVEGUIDE ENTERING THROUGH REAR OF CABINET

FIG. B

NOTES:
1. THIS EQUIPMENT SHALL BE PLACED LOW ENOUGH FOR REASONABLE MAINTENANCE CONSISTENT WITH THE SHORTEST TRANSMISSION LINE TO THE ANTENNA.

2. THIS EQUIPMENT SHALL HAVE A MINIMUM CLEARANCE OF 30 INCHES FRONT AND REAR.

3. PROVIDE A MINIMUM CLEARANCE OF 6 INCHES ON THE RIGHT SIDE AND 0 INCHES ON THE LEFT SIDE OF LEFT TO RIGHT GROWTH BAYS; AND 6 INCHES ON THE LEFT SIDE AND 0 INCHES ON THE RIGHT SIDE OF RIGHT TO LEFT GROWTH BAYS. THE 6 INCH CLEARANCE MAY BE REDUCED TO 0 INCHES WHEN EQUIPMENT OF FIGS. 4, 5, 6 OR 7 ARE ADJACENT TO THIS EQUIPMENT.

ISS.	REV.	DATE	APPROVED
1	1	5-3-68	D.H.Y.

ED-45471-01 2 SHEETS

RADIO SYSTEMS
TE RADIO
TYPICAL OFFICE PLAN

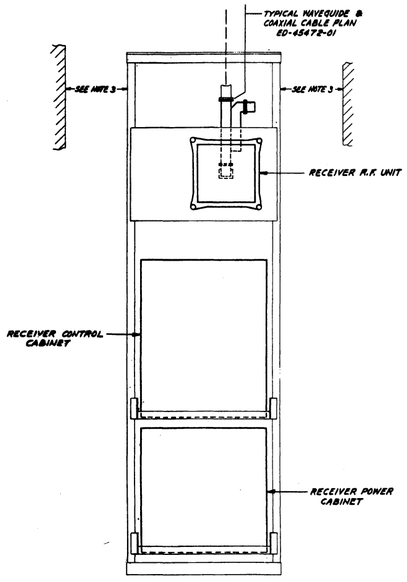
AT & T CO. STANDARD

R3

ED-45471-011

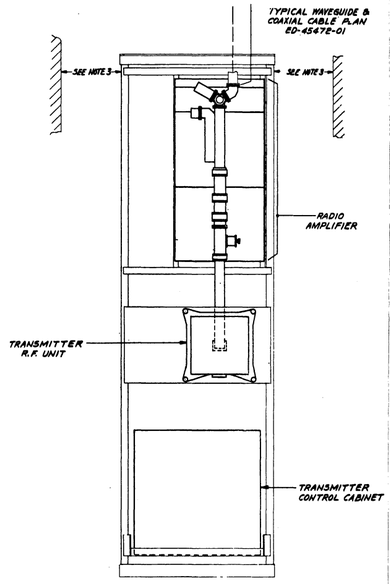
BELL TELEPHONE LABORATORIES, INC.

ED-45471-011



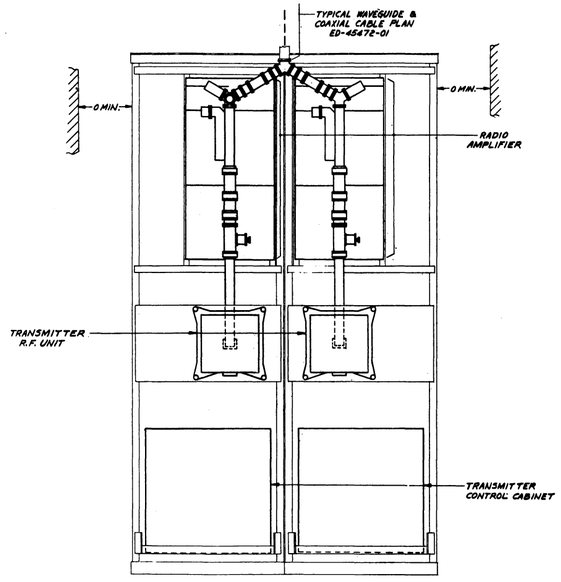
ARRANGED FOR LEFT TO RIGHT GROWTH
FRONT VIEW
(SEE ED-45473-01 FIG. 1)

TE-2 SINGLE CHANNEL
RECEIVER
FIG. 4
SEE NOTE 2



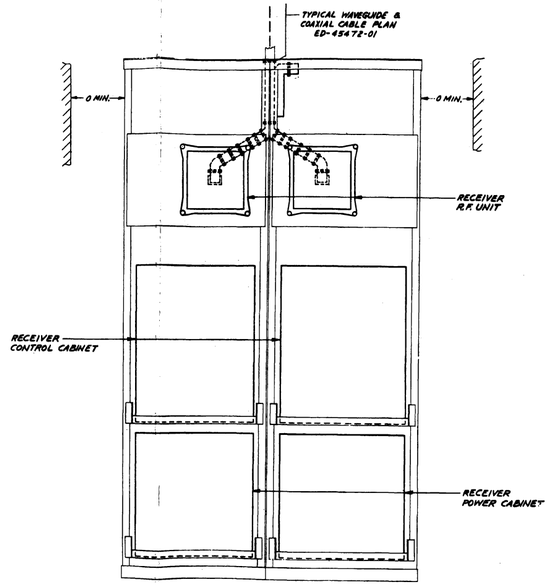
ARRANGED FOR LEFT TO RIGHT GROWTH
FRONT VIEW
(SEE ED-45474-01 FIG. 1)

TE-2 SINGLE CHANNEL
TRANSMITTER
WITH TE-AI AMPLIFIER
FIG. 5
SEE NOTE 2



FRONT VIEW
(SEE ED-45474-01 FIG. 2)

TE-2 DUAL CHANNEL
TRANSMITTER
WITH TE-AI AMPLIFIERS
FIG. 6
SEE NOTE 2



FRONT VIEW
(SEE ED-45473-01 FIG. 2)

TE-2 DUAL CHANNEL
RECEIVER
FIG. 7
SEE NOTE 2

DWG NO. 1

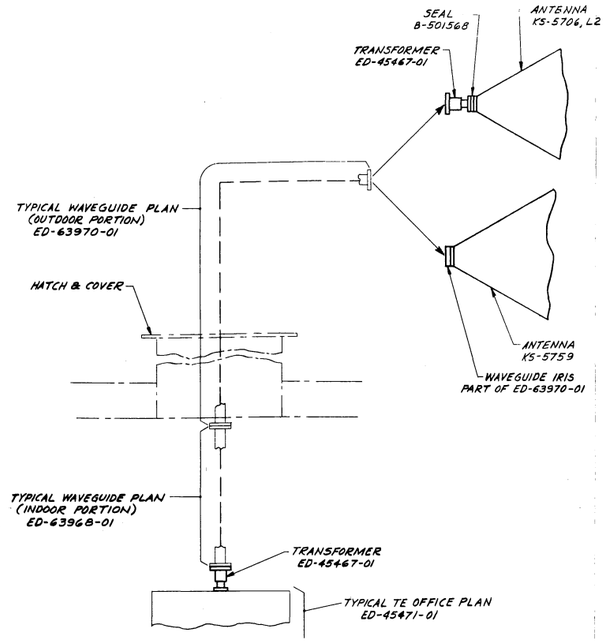
ED-45471-012

TE RADIO
TYPICAL OFFICE PLAN
BELL TELEPHONE LABORATORIES, INC.

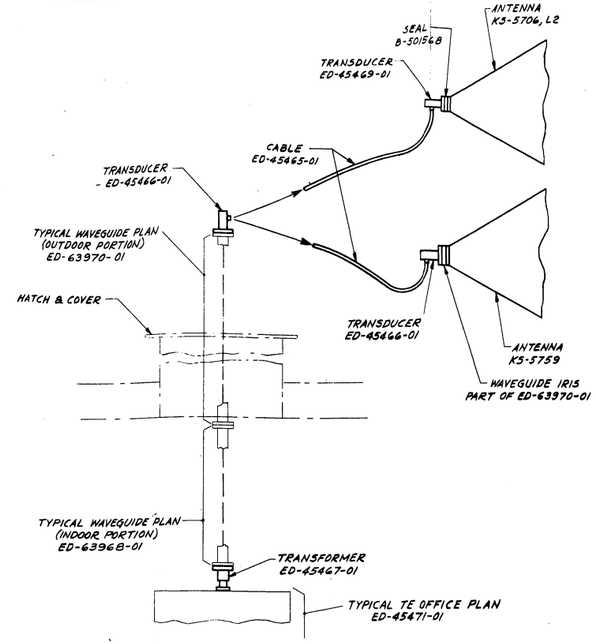
2 SHEETS SHEET 2
ED-45471-012
R3

ED-45471-012

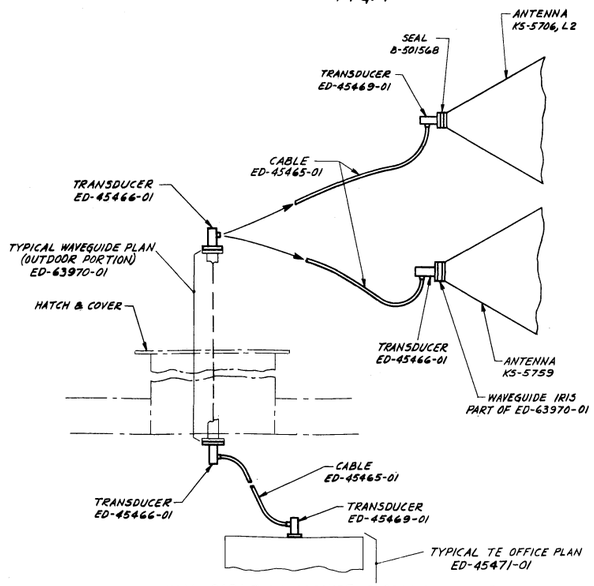
ISSUE NO.	REVISED BY LETTER	DATE REVISED	APPROVED
1	1	3-1969	G.N.T.
2A	2A	4-1969	G.N.T.



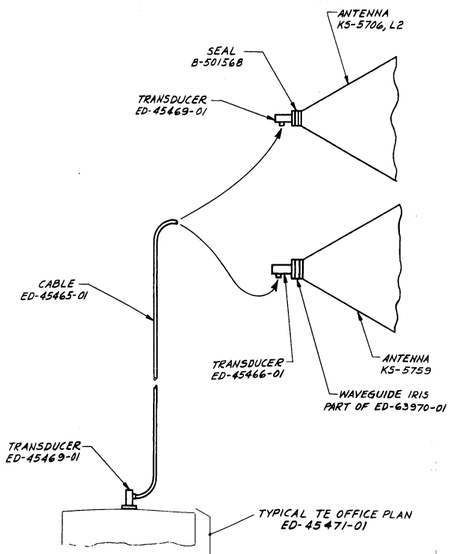
ALL WAVEGUIDE
SHIELDED LENS ANTENNA
FIG. 1



COAXIAL CABLE AND WAVEGUIDE
SHIELDED LENS ANTENNA
FIG. 2



COAXIAL CABLE, WAVEGUIDE, & COAXIAL CABLE
SHIELDED LENS ANTENNA
FIG. 3



ALL COAXIAL CABLE
SHIELDED LENS ANTENNA
FIG. 4

ED-45472-01 2 SHEETS

RADIO SYSTEMS
TE RADIO
TYPICAL WAVEGUIDE
AND
COAXIAL CABLE PLAN
BETWEEN RF UNIT AND ANTENNA

AT&T CO.
STANDARD

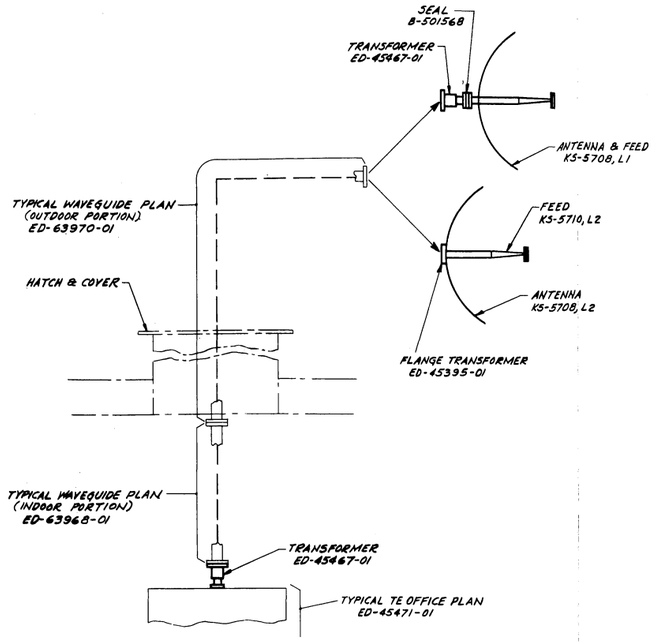
ED-45472-011

BELL TELEPHONE LABORATORIES INC.

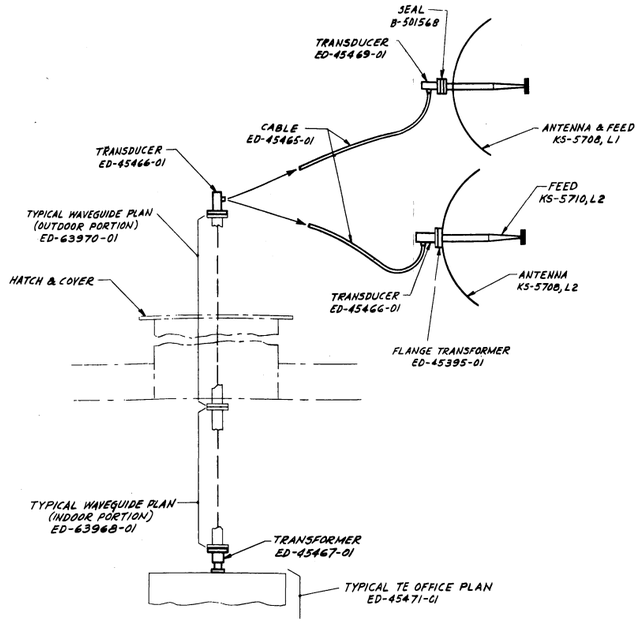
PRINTED IN U.S.A. R1

ED-45472-011

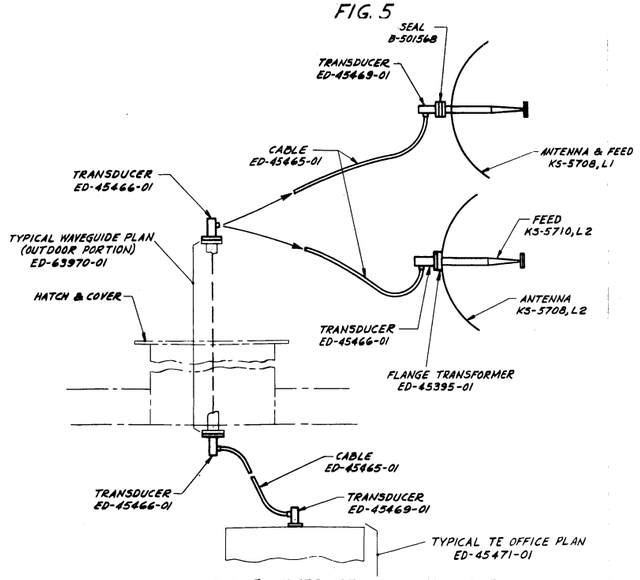
DWG. LES. 1 2A



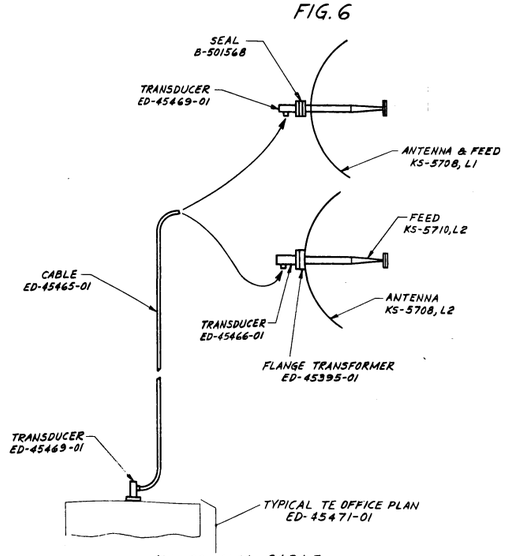
ALL WAVEGUIDE
PARABOLIC ANTENNA
FIG. 5



COAXIAL CABLE AND WAVEGUIDE
PARABOLIC ANTENNA
FIG. 6



COAXIAL CABLE, WAVEGUIDE, & COAXIAL CABLE
PARABOLIC ANTENNA
FIG. 7



ALL COAXIAL CABLE
PARABOLIC ANTENNA
FIG. 8

ED-45472-01S

2 SHEETS, SHEET 2

ED-45472-012

BELL TELEPHONE LABORATORIES, INC. RI PRINTED IN U.S.A.