BNL-104581-2014-TECH

AGS/AD/Tech Note No. 153;BNL-104581-2014-IR

AGS CABLE TELEVISION SYSTEM (FREY)

W. Frey

April 1979

Collider Accelerator Department

Brookhaven National Laboratory

U.S. Department of Energy

USDOE Office of Science (SC)

DISCLAIMER

Accelerator Department
BROOKHAVEN NATIONAL LABORATORY
Associated Universities, Inc.
Upton, New York 11973

AGS DIVISION TECHNICAL NOTE

No. 153

AGS CABLE TELEVISION SYSTEM

W. Frey

April 17, 1979

A dual Community Antenna Television (CATV) system is in use in the AGS building complex. The CATV system is used to distribute multichannel data throughout the AGS service and experimental areas. The AGS Main Control Room (MCR) is the center or source of both systems. The systems are designated by their primary function, i.e., Operating Systems - machine status and data, and User System - experimental user status and data.

The systems are distributed throughout the building complex via a coaxial cable. Isolated taps are provided at convenient locations to monitor the data using commercial TV receivers. Information in the form of computer readouts, video pictures of experimental mechanisms or displays, or recorded lectures, etc. are available for viewing on selected TV channels.

The CATV systems transmits information on 26 available channels in the 5 to 300 MHz frequency band. These channels are grouped into three bands:

(a) Sub-VHF Channels - 4 channels in the 5 MHz to 30 MHz band designated T7 through T10.

(b) VHF Channels - 12 channels in 54 MHz to 216 MHz band same as commercial VHF TV channels.

(c) Super-VHF Channels - 10 channels in 216 MHz to 300 MHz band designated letters J through S.

Two-way communication via the cable is possible, and channels are designated forward and reverse accordingly. A Forward Channel means a channel originating in the equipment room (referred to as the Head-End) over the MCR and sent out over the cable distribution network. A Reverse Channel means a channel originating at a remote site and sent back to the head-end over the cable

distribution network. Due to cable losses, broad-band amplifiers (called line extender amplifiers) have been placed in the distribution network to ensure adequate signal levels for good TV reception at any tap in the system. Since the amplifiers are unidirectional, diplexing networks are provided in the line extender amplifiers to separate the forward and reverse channels to allow two-way communication. Generally, the amplifier is in the forward direction only, since the reverse channels are in the lower frequency band and will experience less cable attenuation.

The main advantages of the CATV system for video distribution in the AGS are:

1. Requires only one coaxial cable for two-way communication.
2. Picture quality is not effected by noise and ripple pick-up from AGS magnet power supplies and cables.
3. Video equalization is not required to restore picture quality.
4. The distribution system is not effected by impedance matching, cable problems and TV monitor problems of a user.
5. The user can monitor various data channels or pictures by just changing channels on a single receiver.

A. User System

The User System is designed primarily for the experimental users, and is distributed to the experimental areas. It is a "Sub-Split" System, i.e., the sub-VHF channels are used as reverse channels only and all other channels are forward channels. Figure 1 is a schematic diagram of the User CATV System distribution network. Cable taps for user TV receivers are located at the base of the columns indicated on the diagram. The cable run from the tap to a potential experimental site should never exceed 100 ft. The signal level at the tap is sufficient that even with a 100 ft cable run, the signal at the TV receiver is sufficient to provide a good quality picture.

Table I lists the channel program assignments on the User CATV System.

Table I

User CATV Channel Assignments

Channel	Program/Assignment	Comments
2	A Target - A SWIC	
3	B Target - B SWIC	
4	C Target - C SWIC	
5	C' Target - C'SWIC	Temporarily C Target
6	Video Tape Program	
7	Forward/Reverse Assignment	T8 source
8	" " "	T9 source
9	" " "	T10 source
10	AGS Status #2	
11	General purpose assignment	
12	AGS Status #1	
13	General purpose assignment	
J	Special experiment assignment	
M	" " "	
N	" " "	
O	" " "	
S	RF/TV Group Test	

Notes:
1. Channels 7, 8 and 9 are forward channels repeating inputs from reverse channels T8, T9 and T10 respectively.
2. General purpose assignment channels can be received on any VHF TV receiver.
3. Special experiment assignment channels can only be received using a special conversion unit, and are reserved for special experimental uses not of general interest by other users on the system.
4. The video tape program channel is used to disseminate general information, seminars, and instructional materials/courses.
5. Other super-channels, K, L, P, Q and R are not available at this time.

The channel assignments are updated by memo periodically to reflect the changes in User CATV cable usage.

B. Operations System

The Operations System is used to monitor AGS machine function, and is distributed to AGS operations areas, e.g., Linac, Rf Building, Siemens Motor/-Generator Building, etc. It is a mid-split system, i.e., the sub-VHF and low number (2, 3, 4, 5 and 6) VHF channels are used as reverse channels, while the high number (7, 8, 9, 10, 11, 12 and 13) VHF channels and the super-channels are used as forward channels. Figure 2 is a schematic diagram of the Operations CATV system distribution network. Table II lists the channel program assignments on the Operations CATV System.

Table II

Operations CATV Channel Assignments

Channel	Program/Assignment	Comments
7	Linac Security System sequential video	T8 source
8	Linac Security System selected video	T9 source
9	Video Tape Program (same as User Channel 6)	
10	Forward/Reverse assignment	T11 source
11	" " "	T10 source
12	AGS Status #1	
13	AGS Status #2	
J	Special assignment	
K	" "	
L	" "	
S	Rf/TV Group Test	

Notes:
1. Channels 7, 8, 10 and 11 are forward channels repeating inputs from reverse channels T8, T9, T10 and T11.
2. Reverse channels 2, 3, 4, 5 and 6 are reserved for ISABELLE inputs to AGS.
3. Other super-channels, M, N, O, P, Q and R are not available at this time.

C. System Expansion

Both systems have room for expansion by adding super-channels. This is a problem in the User system since converters are required to receive the super-channels on the TV sets. The converters do not pose a problem in the Operations system since most of the viewing is done in control rooms and they use the converters for remote channel selection anyway.

D. ISA/AGS Interconnection

The ISA complex will, in all probability, have its own independent video distribution network. However, the AGS Operation CATV system has provision for the exchange of video information between the AGS MCR and the ISA MCR. VHF channels 2 through 6 in the Operations system have been reserved for information originating at ISA to be fed to the AGS MCR. Figure 3 is a rough sketch of the general layout of the interconnected in one of two ways:

1. Coaxial cable from AGS head-end to ISA head-end.
2. Microwave link between AGS and ISA Service Bldgs.

1. Coaxial Cable

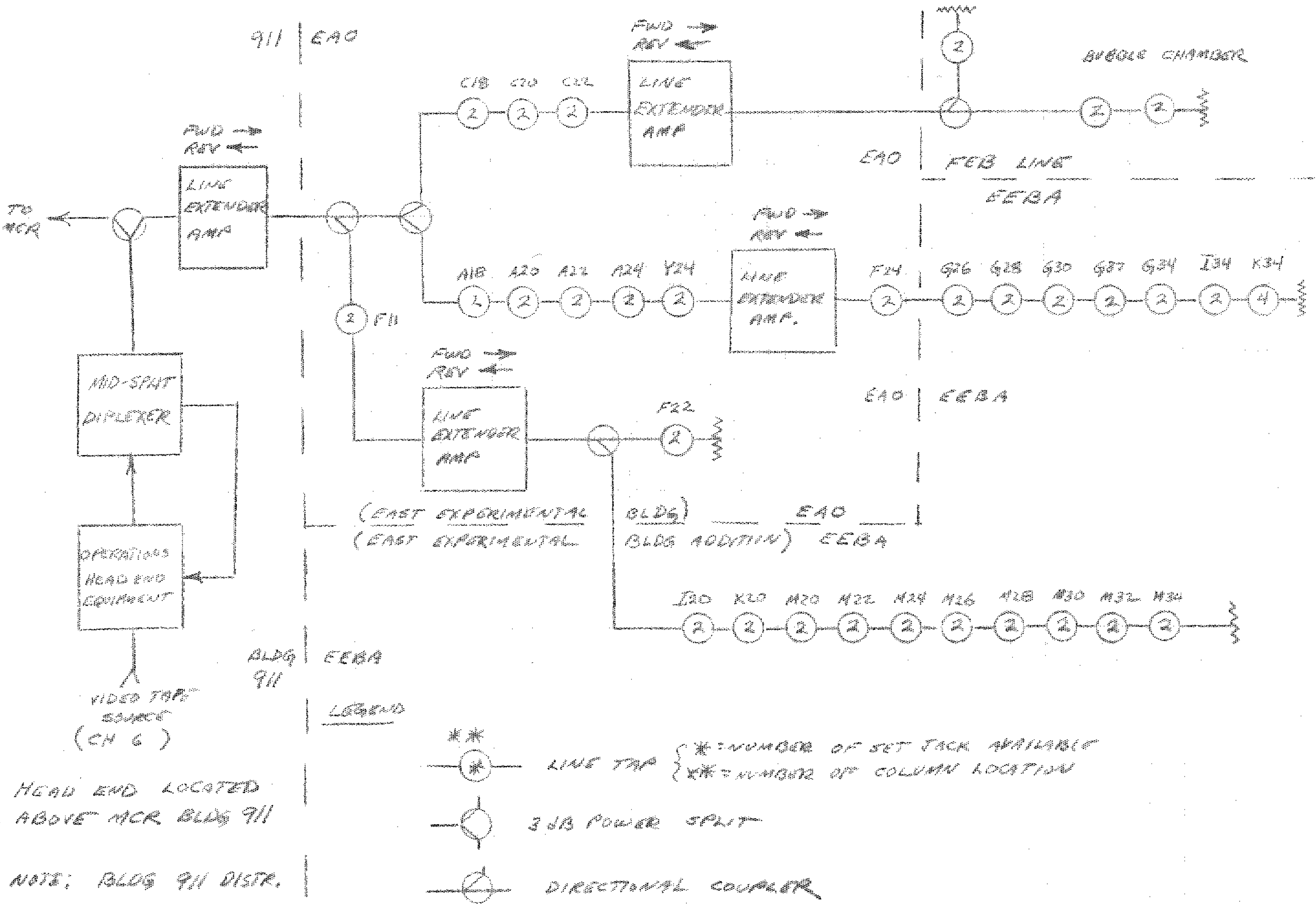
A coaxial cable is considered as the primary method of interconnection since it offers the most flexible means of forward/reverse communication.

Referring to Fig. 3, an estimated coaxial cable run of 4000 ft minimum would be required for the interconnection. This cable run would be low-loss cable, 0.750 in. o.d., and would necessitate one or two (depending on cable lengths, available amplifier gain, and cable pulling vault locations) line amplifiers to maintain proper signal-to-noise-levels. The shortest run would be from the AGS head-end out via the FEB line, ISA injection line conduit to the ISA head-end.

2. Microwave Link

A microwave link should be considered as an alternative method of interconnection. The cost of cable, line amplifiers, cable pulling crews, etc. continues to go up, while microwave communication equipment cost is going up at a slower rate. An engineering trade-off study should be made to evaluate a microwave link vs coaxial cable. Since the ISA Building will be a three-story building, a 2200 ft direct line-of-sight (LOS) without passive repeaters, between the AGS and ISA Service Buildings may be possible.

Distr: Dept. Admin., Oper. Coordinators, AGS Div. EE's, AGS Div. Tech. Supervisors, R. Frankel, J. Humphrey, A. White, HEEP.



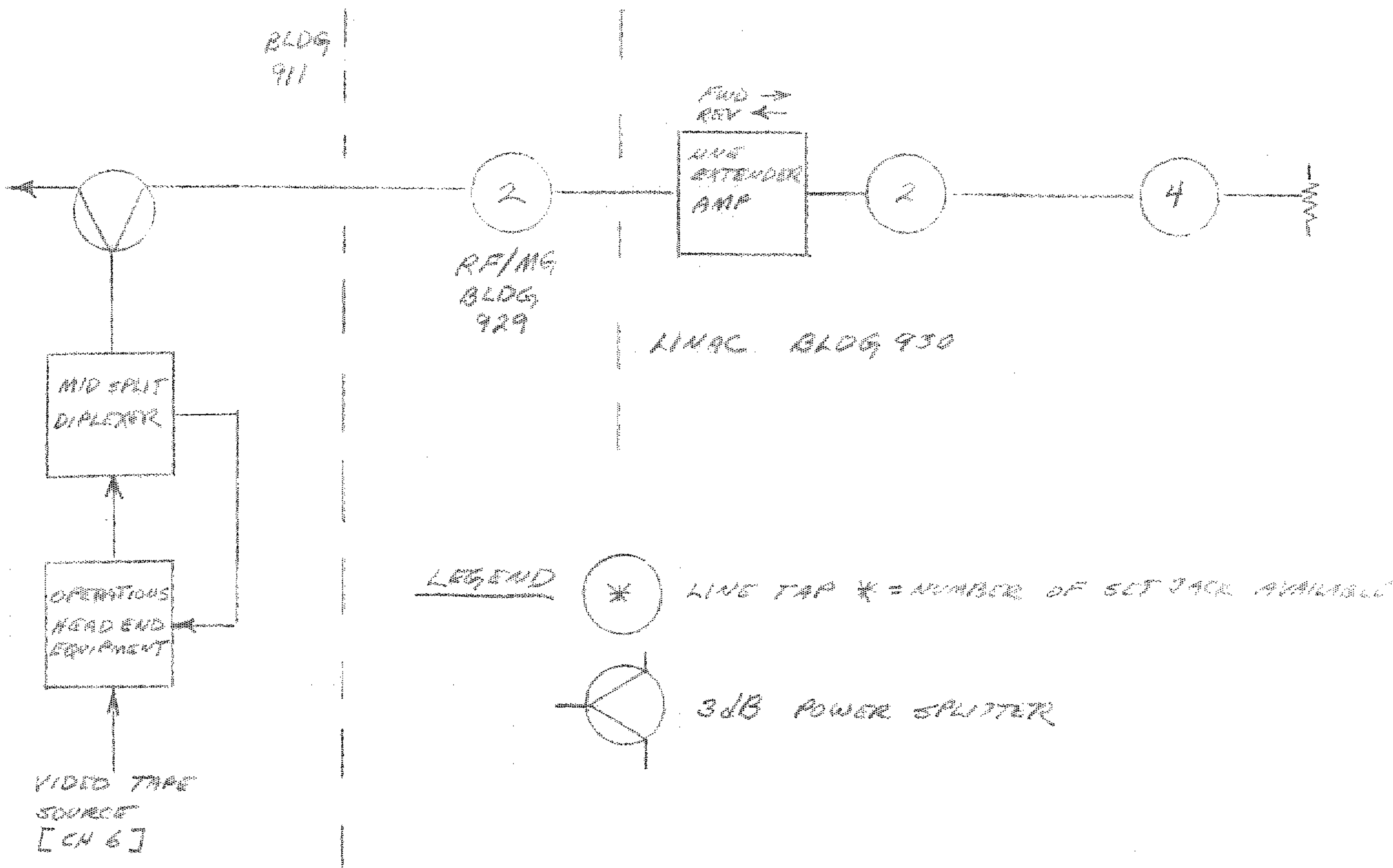
HEAD END LOCATED ABOVE MCR BLDG 911

NOTE; BLDG 911 DISTR. NOT SHOWN FOR CLARITY

FIGURE 1
USER CATV DISTRIBUTION

BROOKHAVEN NATIONAL LABORATORY

BY________DATE________
CHKD. BY________DATE________
SUBJECT________________
DEPT. OR PROJECT________________
SHEET NO.____OF____
JOB NO.________



HEAD END LOCATED ABOVE MCR BLDG 911

NOTE! BLDG 911 DISTRIBUTION NOT SHOWN FOR CLARITY

FIGURE 2

OPERATIONS CATV DISTRIBUTION

SP 11037A

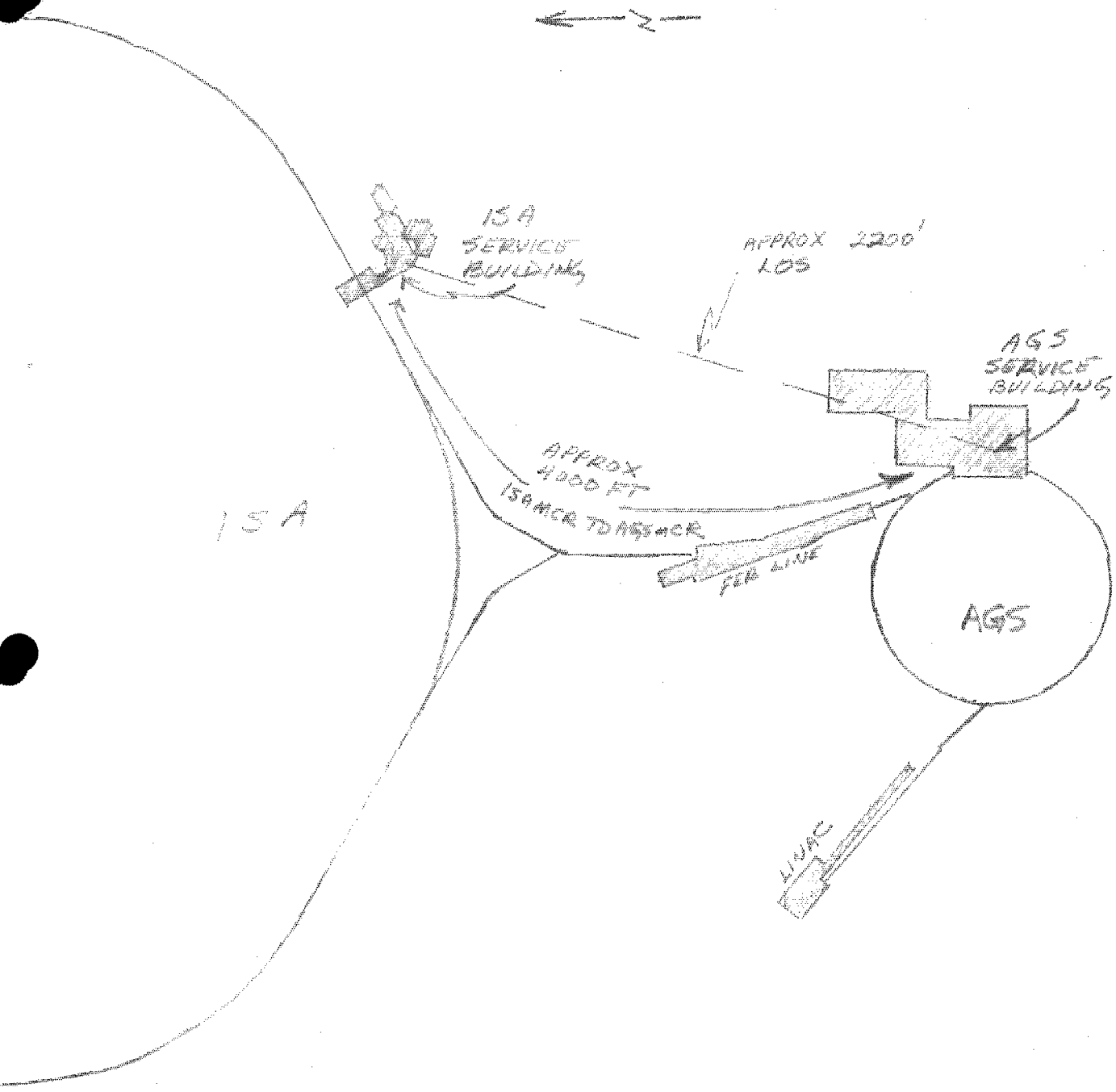


Figure 8
APPROXIMATE LAYOUT
AGS TO ISA