COG Memo No. 17

NATIONAL RADIO ASTRONOMY OBSERVATORY
Charlottesville, Virginia

SPECIFICATION: A31800N1, Revision A

TITLE: NRAO Data Communications Network

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1. Introduction

This specification covers a network of data communications between Green Bank, West Virginia; Charlottesville, Virginia; VLA site, New Mexico and Socorro, New Mexico. Data terminal equipment (DTE) involved consists of CRT terminals (both text and graphic), IBM computers (both scientific and fiscal), printers, card readers, VAX computers, DEC 10 computers, ModComp computers, word processors (both IBM and A. B. Dick).

The present planned communications requirements are illustrated in Table I and Figure 1. Included in the table are (*) additional spare communication links which are to be included in the hardware. A second set of communication links (**) which can be handled by the system by adding plug-in modules.

2. Functional Description

A. The three trunks - A, B and C - will each be a single leased 4-wire, D-1 conditioned line.

B. The following description is to cover a future planned expansion in which there will be word processors at every site. It is covered here to insure that the system can be expanded to this capability. The word processors will operate as follows: The switches in Charlottesville and at the VLA site shown (Figure 3) connected between two SDLC ports on the statistical multiplexer and a word processor will be installed by NRAO. A table of switch settings versus word processor communications follows:

Route No.	Switch-Position	Word Processor (WP) Communications
1	1-A	GB-WP to CV-WP
2	1-B, 2-A, 3-A	GB-WP to VLA-WP
3	1-B, 2-A, 3-B, 4-A	GB-WP to SOC-WP
4	2-B, 3-A	CV-WP to VLA-WP
5	2-B, 3-B, 4-A	CV-WP to SOC-WP
6	4-B	VLA-WP to SOC-WP

The following combinations can be simultaneously communicating:

Routes Number 1 and 4 and 6

Routes Number 1 and 5

Routes Number 2 and 6

The program in the statistical multiplexer will not have to be changed for the different routings. It will be initially programmed for three communication links: GB-CV, CV-VLA and VLA-SOC. As an example, when the word processor in Green Bank is communicating with the word processor in Socorro, it is doing so by going through three links in series.

C. The network ports (trunks) - the connection between the statistical multiplexer and the modem - will normally operate at 9600 bps with the modem clocks being fed into the statistical multiplexer network ports. If a dedicated line between modems is not capable of sustaining 9600 bps, the modem clocks at both ends of the line will be changed to 4800 bps until the line is repaired. The statistical multiplexer will follow the modem clocks in setting its network port speed. If the change occurs in the middle of a packet (frame) and a data error occurs, this will be detected by the receiving statistical multiplexer and a retransmission of the data will be requested.

D. The bandwidth of each link - represented by the 9600 bps rate - shall be used by the statistical multiplexer at its maximum rate whenever data is to be transmitted. For example, a portion of the bandwidth shall not be reserved at all times for synchronous data (SDLC or DDCMP) - that is, if the two VAX computers are idle and not transmitting and receiving, other data from other synchronous or asynchronous devices could use the 4800 bps normally occupied by the VAX data.

E. It is obvious from Table I that the links could easily become overloaded if too many devices try to communicate simultaneously. The statistical multiplexers are to prevent their own memories from overflowing and controlling the flow of data by the use of XON and XOFF or by toggling the DSR signal. If the system is operating properly and still causes unacceptable delays, it will be the observatory's decision to either accept the delays, assign priorities to the different types of data or expand the system by adding additional trunk lines between sites.

F. Mechanical description: The individual units making up the system will be capable of direct mounting in a standard rack which will accept 19 inch panels and has an overall depth of 25 inches and a panel height space of 61 inches. No special cooling will be provided for the individual units, but the rack will be open for free convection flow of air. The ambient air limits will be between 55°F and 95°F. The units should operate as specified over this temperature range. Normally, the ambient temperatures will be from 65°F to 80°F.

G. Figure 2 illustrates in detail the equipment at Charlottesville. The other three sites would be similarly configured, with Green Bank and Socorro having only one network port (trunk).

H. The modems will be full duplex, synchronous, binary serial data and operate at 9600 bps with a fallback rate of 4800 bps. The data interface will conform to EIA RS 232C and CCITT V.24. The modems will have digital and analog loopback capability.

cc: C. Broadwell
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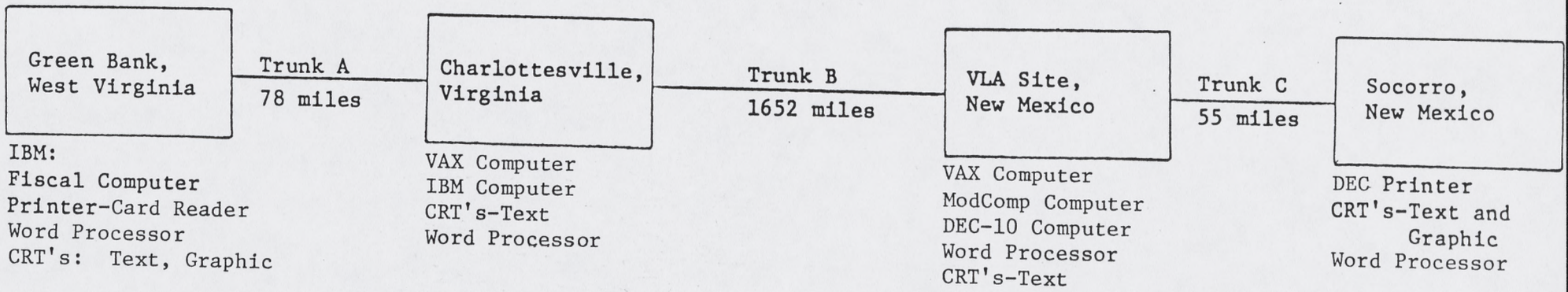
TAB

LINK COMMUNICATIONS NUMBER	RATE	PROTOCOL	TYPE OF DATA	NO. OF STAT. MUX TERMINAL PORTS GB	CV
TRUNK A					
1. GB-CRT to CV-VAX	4800 bps	Async.	Graphics	1	1
2. GB-CRT to CV-IBM	1200 bps	Async.	Text	3	3
3. CV-IBM to GB-Printer/Card Reader	4800 bps	By-Sync.	Text	1	1
4. GB-Fiscal IBM to SOC-CRT	2400 bps	Sync. SNA/SDLC	Text	1	0
*5. CV to GB (unspecified DTE)	1200 bps	Async.		1*	1*
**6. CV to GB (unspecified DTE)	1200 bps	Async.		2**	2**
TRUNK B				CV	VLA
1. CV-VAX to VLA-VAX	4800 bps	Sync.-DDCMP		1	1
2. Same as 4 in Trunk A.				0	0
3. Control Terminal Port	1200 bps	Async.	Supervisory	1	0
4. CV-CRT to VLA-DEC 10	1200 bps	Async.	Text	1	1
5. CV-CRT to VLA-VAX	1200 bps	Async.	Text	1	1
6. VLA-CRT to CV-IBM	1200 bps	Async.	Text	1	1
7. VLA-CRT to CV-VAX	1200 bps	Async.	Text	1	1
*8. CV to VLA (unspecified DTE's)	1200 bps	Async.		1*	1*
**9. CV to VLA (unspecified DTE's)	1200 bps	Async.		5**	5**

TAB

LINK COMMUNICATIONS NUMBER	RATE	PROTOCOL	TYPE OF DATA	NO. OF STAT. MUX TERMINAL PORTS VLA	SOC
TRUNK C					
1. SOC-CRT to VLA-DEC 10	4800 bps	Async.	Graphics	1	1
2. SOC-CRT to VLA-DEC 10	1200 bps	Async.	Text	2	2
3. SOC-CRT to VLA-ModComp	1200 bps	Async.	Text	1	1
4. VLA-DEC 10 to SOC-Printer	4800 bps	Async.	Text	1	1
5. Same as 4 in Trunk A	2400 bps	Sync. SNA/SDLC	Text	0	1
6. Word Processors VLA to SOC	2400 bps	Sync. SNA/SDLC	Text	1	1
*7. VLA to SOC (unspecified DTE's)	4800 bps	Async.		1*	1*
**8. VLA to SOC (unspecified DTE's)	1200 bps	Async.		1**	1**



NOTES: Trunks consist of one (1) each leased 4-wire, D-1 conditioned line.
Mileages given are tariff mileages.

NRAO DATA COMMUNICATIONS NETWORK

Figure 1

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1/15/82

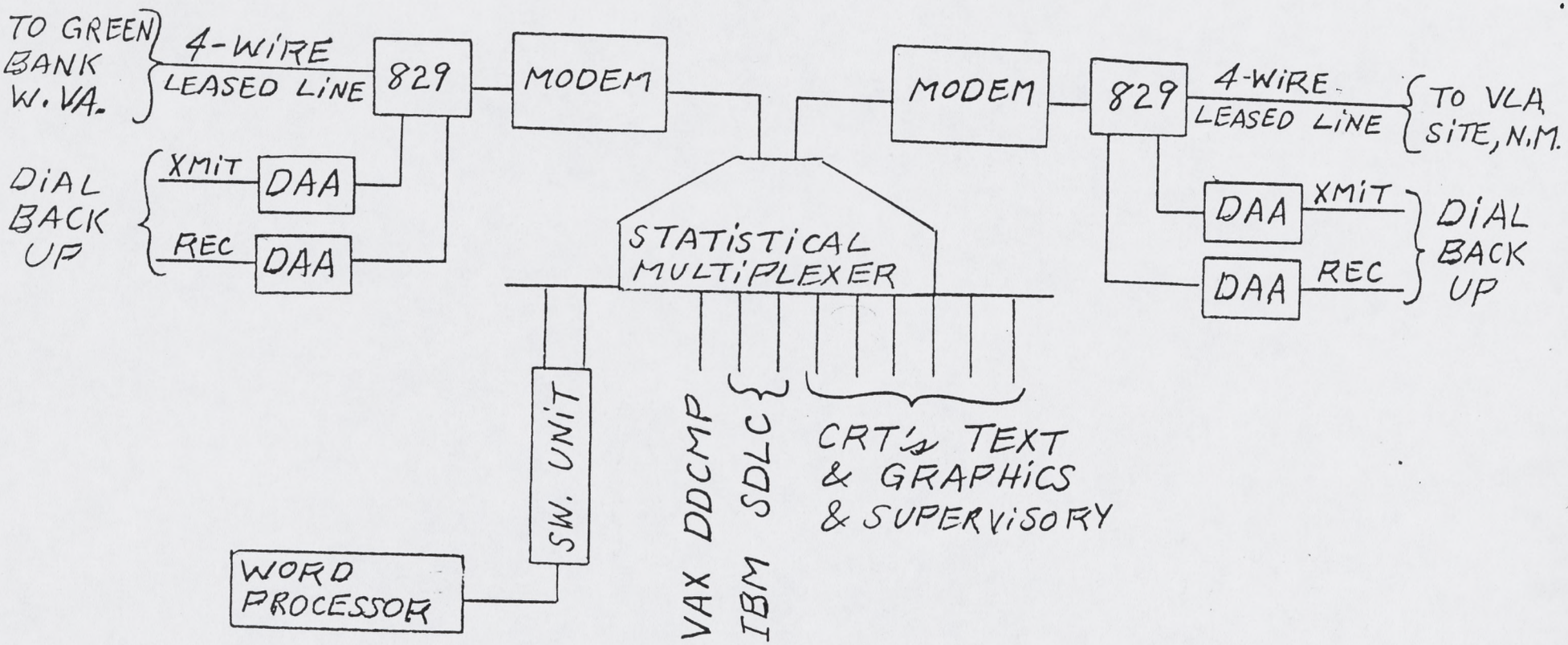

FIG. 2 NRAO CHARLOTTESVILLE DATA COMMUNICATION SYSTEM

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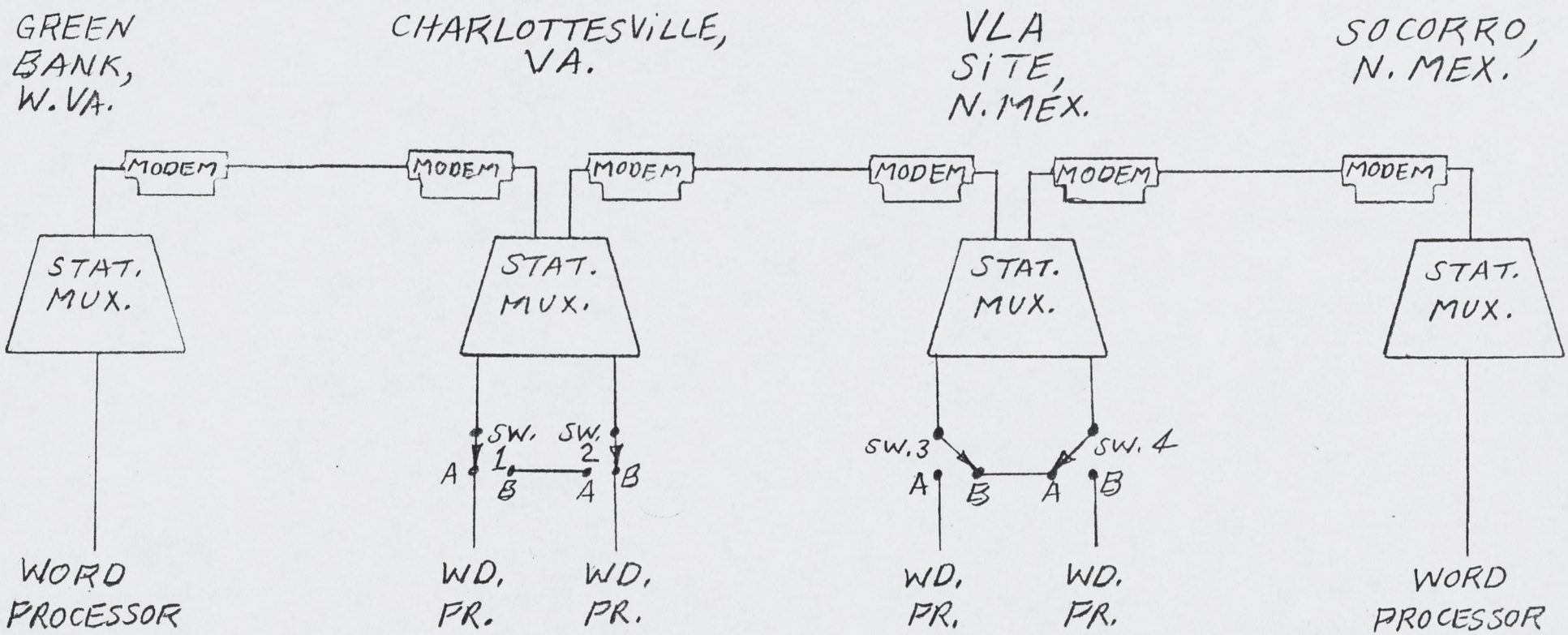

NOTE: SWITCH POSITIONS SHOWN ABOVE CONNECT ROUTES 1 & 5. SEE PARAGRAPH 2B.

FIGURE 3 WORD PROCESSOR SWITCHING IN NRAO DATA COMMUNICATIONS NETWORK.

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