

National Radio Astronomy Observatory

Charlottesville, Virginia

TO: COG MEMBERS 8-10-83

FROM: CHUCK BROADWELL *CMB*

SUBJECT: NRAO DIGITAL DATA SWITCH (DDS)

I have attached a preliminary description of the basic functions to be provided by the DDS as far as user interactions are concerned. I plan to initially provide only a minimum number of special features, such as queueing, in order to arrive at a functioning system as soon as possible, but will appreciate any suggestions and comments concerning the attached description and features that people think may be desirable either initially or in the future.

One bit of information that I need has to do with the use of the "break" key for disconnecting when the user is finished. Whenever two devices are connected together through the DDS, we plan to require that the user hit the "break" key when the connection is no longer required, unless one of the devices makes use of the "break" for other purposes, in which case one of the devices must drop a modem type signal (DTR or equivalent) to notify the DDS to disconnect the two devices. I need to come up with an approximate count of the number of ports for which "break" cannot be used, so that we have some idea how many ports will require the use of modem type signals. If anyone knows of specific instances, other than the IBM ports in Charlottesville, where we can not use "break", please let me know.

If anyone is interested in having a COG meeting to discuss the DDS, let me know and I will have Cathy set up a meeting for the week of August 29, otherwise please direct any comments directly to me.

PRELIMINARY USER INFORMATION

The following text attempts to describe the present plans for the NRAO Digital Data Switch from the user's point of view.

INTRODUCTION

The NRAO Digital Data Switch is an electronic switching system to which asynchronous devices (crt terminals, modems, computer ports etc.) may be wired in order to allow any one device to request connection to any other device.

The DDS (Digital Data Switch) will use the following communications parameters when talking to a user:

8 data bits  
0 parity bits  
1 stop bit

The baud rate may be individually defined for each specific device. Baud rates of 300, 1200, 2400, 4800 and 9600 will be supported.

These parameters are in effect only when the user is communicating with the DDS. After a connection between two devices is established, the only restraint is that the baud rate be between 110 and 9600 baud.

There are up to 504 individual ports available to the user in a DDS. In a minimal system, there are 56 ports available. It is possible to request any one specific port by its port number, which requires a "phone book" to look up the port number of a given device. Port numbers consist of three decimal digits where the first (MS) digit counts 0 through 7 and the next two digits count 0 through 63. (These numbers are directly related to the hardware.) The port numbers available to the user start at 008 and go thru 763 in the following sequence:

008, 009,-- 063, 100, 101,-- 163, 200,---- 663, 700,-- 763.

Ports 000 through 007 are dedicated for communication between the DDS and the users.

Normally, if a user wants to connect to a specific computer, or to another NRAO site, he will not be concerned with the exact port number. For example, at the VLA if the user wants to connect to the DEC-10, there may be on the order of thirty different ports available and the user normally would not care which physical port he actually connects to.

Thus, in general, we assign mnemonics to classes of ports that can be lumped together. At the VLA, all normal DEC-10 tty ports will have a mnemonic such as "DEC" or "DEC10" for example, and the VAX computers will be assigned mnemonics like "VAX1" and "VAX2" or "AIPS" etc. When a user requests a port by mnemonic, the DDS system will check all ports identified by that mnemonic that have the same baud rate as the user, looking for an available port. (An option is provided to allow the user to specify a baud rate different from his own.) Using this scheme, a user does not have to request a specific physical port and if that port is busy then request a second one etc. since the DDS system will automatically check all ports looking for a free one.

If desired an individual port may be assigned a specific mnemonic and be the only port identified by that mnemonic. The only restriction on this is that only 255 different mnemonics are allowed at present but it is felt that this should be sufficient.

There is a "default" mnemonic assigned in each DDS that is used to identify each port that does not otherwise have a mnemonic assigned. (For example, terminals normally should not need to be identified by mnemonic). The user is not able to access these ports by mnemonic, but can request them by specific port number.

In the case of a user at one site requesting connection to a port at another site, there are two different cases to consider:

1) If there is a DDS at the second site, the following example represents the sequence:

A user at the VLA requesting connection to the IBM in Charlottesville would first request connection to "CV". When the VLA DDS completes the connection of the user to one of the Codex paths to Charlottesville, (which is connected to a corresponding port on the DDS in CV) the Charlottesville DDS will then be ready to accept requests from the user, so he would then request connection to the IBM.

2) If the second site does not have a DDS then each device from the second site would be treated as a local device, since each path through the Codex system is essentially a dedicated hardware path.

#### MNEMONICS

From the user's point of view, each mnemonic consists of up to 8 alpha-numeric characters where the first character must be a letter. There is no limit to the number of ports which may be identified by the same mnemonic, and such ports do not need to have the same baud rate.

Internally, each mnemonic is defined as above, with a ninth

character extension which represents baud rate. Thus, if two ports have the same mnemonic and different baud rates, then internally they actually use up two of the 255 possible mnemonics that may be defined.

When a user requests connection to a port by use of a mnemonic, if the user appends a slash followed by the first digit of one of the supported baud rates to the mnemonic, then the DDS will search for a port that is identified by the mnemonic and has the specified baud rate extension. If only the mnemonic is specified, then the DDS will search for a port that is identified by the mnemonic and has the same baud rate extension as the requesting port.

#### CONNECTING AND DISCONNECTING

In order to make a connection request, the user must press the return key (or otherwise send a "return" character to the DDS). The DDS will respond within one or two seconds unless there are already 8 simultaneous requests being handled, in which case the DDS will not be able to respond until an empty request slot becomes available.

Two different user protocols will be defined, one intended for "humans" and one for "machines".

While the DDS is communicating with the user, there is a timeout limit. If the user does not complete a response to a DDS prompt within 60 seconds, the DDS will disconnect from the user. Responses are terminated only with a return or an escape.

When the DDS processes a request and provides a connection, the final communication from the DDS to the user before the connection is made will be a message such as:

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PORT xxx CONNECTING TO PORT yyy
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After the DDS sends this message, there will be a delay on the order of one to two seconds before the actual physical connection is made.

After the user has been connected to a requested port, there are three ways by which the connection may be broken:

- 1) If there is no activity on the transmit data line from either of the two ports for a specified time period, then the DDS will disconnect and send a timeout message to the port on which the timeout limit was reached.

The timeout limit ranges from 10 minutes to 130 minutes in steps of ten minutes, and the limit for a port may be set so that time out will not occur.

- 2) If a "break" condition is detected on the transmit data line from either port, then the DDS will disconnect and send a disconnect message to the port which sent the break. Each port may be set so that "break" will be detected or ignored.
- 3) If Data Terminal Ready or Carrier Detect is dropped on any port which is making use of the "modem type" signals, the DDS will disconnect and not send any type of message to either port. These signals will only be used when required, for devices such as modems and for computer ports like the IBM ports in CV where "break" can not be used for disconnecting because the computer makes use of the "break". For all computer ports where "break" is not available to the DDS, then the computer port must be programmed so that it will drop DTR when the user logs off.

### QUEUEING

When the user initially sends a return to the DDS in order to make a request, if there are 8 simultaneous requests already being processed, then the user is placed in a hardware queue and receives no prompt from the DDS until a request slot becomes available.

When the user requests connection to another port, if there is no port free that matches the request then the DDS will tell the user how many requests are already in the queue and offer the user the opportunity to enter the queue.

If the user enters a queue, at any time while waiting he may determine his present position in the queue or exit the queue. When the user's turn comes, the DDS will ring the bell on the user's terminal and make sure that the connection is still desired.