Synopsis

Your interactive terminal is probably connected to the local Edinburgh University network (EDNET) via a Packet Assembler Disassembler (PAD). It has a number of characteristics such as the width and height of the screen which are referred to in this Note as terminal CHARACTERISTICS. You can make your terminal behave in a particular way by telling the PAD to put it into a certain MODE.

The purpose of this Note is to show you how to check and alter these CHARACTERISTICS and MODES.

Note that if your terminal is connected to EDNET via a Terminal Control Processor (TCP) you should contact the ERCC Advisory service at The Kings' Buildings on 031-667 1081 ext. 2976 or at George Square on 031-667 1011 ext. 2300. The advisers will provide you with information on TCPs. PADs are expected to replace TCPs by January 1987 although one or two may remain for a few months after that date.

Keywords

displayx3, EMAS3MODESTR, EMAS3VDUB, EMAS3VDUC, EMAS3VDUI, EMAS3VDUS, modestr, PAD, setmode, terminaltype, ttyinit, ttylist, vdub, vduc, vdui, vdus, xmode.

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1. INTRODUCTION

This Note is addressed to users on the Edinburgh University communications network (EDNET). It describes:

- terminals,
- PADs,

both of which are of general interest to all users of interactive services, and

- facilities on EMAS 2900 and EMAS-3.

which are of interest only to users on the BUSH, EMAS and EMAS-A host computers.

If you are an established user who is used to the operation of a TCP and you have been moved to a PAD, see Section 2.1 which is called **BASIC RULES FOR USING YOUR TERMINAL**

Your terminal has a keyboard and a screen or a printer. On EDNET, terminals are invariably operated in full duplex mode, under which there is no direct connection between the keyboard and the display (or printer). What you type on the keyboard is transmitted over the network to a PAD (see below), but it is not displayed on the screen. The PAD can transmit text to the screen or printer, and that is what is actually displayed. Thus it is perfectly possible for you to type *The quick brown fox jumps...* while the text appearing on the screen is saying *It's a braw bricht moonlicht nicht the nicht.* However, PADs normally echo whatever they receive from the keyboard - that is, they transmit it straight back to the screen. The delay in echoing is usually imperceptible, so that your terminal appears to behave as if the screen were linked to the keyboard. Besides displaying this echoed copy of what you type yourself, the display (or printer) of your terminal also shows text which has been sent from the host which you are using - typically a mainframe computer providing the EMAS 2900 or EMAS-3 service.

There are switches on your terminal to control the way it operates. Normally you should never touch these: if the terminal is working at all, leave them alone. You may, however, need to start off by setting them up when the terminal is first installed. If there is a control which selects full or half duplex, set it for full duplex. If there is a control which determines the operating speed of the terminal, set it to 9600 bits/second if your terminal type is a VDU. If your terminal has a printing facility rather than a screen, you have the choice of setting it to 300 or 110.

The PAD has the job of passing on whatever you type to the host which you are using. Echoing the text back to your screen or printer is a minor part of that task. The PAD also takes text sent from the mainframe and passes it on to the display of your terminal.

Your terminal is connected to the PAD by a direct physical link - a continuous cable which is not shared with any other terminal. The PAD communicates with the host via EDNET. One PAD will handle several terminals simultaneously, all being used by different people and possibly talking to different hosts.

Part of the network's duty is to cope with all those complications so that you have the impression of talking to the host through a direct link. You should almost never be aware that your terminal is sharing a PAD with several others.

To make thing easier for you, the PAD performs some useful services. For instance, when you have typed a line of text (such as a command) to be sent to the host, you press the RETURN key. It would be tedious to have to press the LINE FEED key as well, but most terminals need both characters to get the display or printer to move on to the beginning of the next line. If the PAD echoed exactly what you typed, then pressing the RETURN key would get you back to the start of the line which you had just typed. This would obviously be inconvenient as you would overwrite the same line again and again and you would not be able to look over what you have typed before. So the PAD sends a line feed back to the terminal with every carriage return which it echoes. (Note that some PADs are configured so that they do not echo a line feed after a carriage return although this can be altered as described on page 28 of the *JNT-PAD TERMINAL USER'S GUIDE*, which may be consulted at the ERCC Advisory service.)

It is possible for you to say how you want your terminal to behave. For instance, you can say that you want long lines to be divided into two after 72 characters or after 80 or after 132. You would normally choose a value which corresponds to the width of your screen or printer. If you do nothing to specify it, the PAD will follow some built-in default behaviour, and this default is often quite acceptable, so you may never need to give instructions to the PAD. If you do need to, there are two ways to go about it:

- break into the PAD from your terminal and alter settings locally at the PAD (see Section 2), or
- issue a command at the host which will transmit a message to the PAD and alter the required settings (see Sections 3 and 4).

As mentioned before, your terminal's CHARACTERISTIC and MODE settings can be altered or interrogated. They are referred to in this Note as keywords, and they are changed by giving them a parameter which is either a number or ON/OFF. For example, the keyword for the number of characters you can type on your terminal before the carriage return and line feed characters are inserted is WIDTH. This keyword takes a decimal number as its value, e.g.

WIDTH=132

The keywords with their uses and parameters are described in Section 4.3.

There are many different kinds of terminals used on the network. They each have their own peculiarities of behaviour and specification. Intelligent terminals are now widespread around the network. On these devices, packages can be used which utilize this built-in intelligence. These packages will set the required MODES and CHARACTERISTICS and reset them when the package is closed. Each type will be most convenient to use if the PAD adjusts its behaviour to be appropriate – for example, if it breaks long lines at the actual width of the screen or printer. However, PADs do not know the types of terminal that are attached to them. One PAD will generally serve terminals of several different types. So the PAD cannot automatically adjust its behaviour to suit the individual terminal type. It is up to the terminal user to:

a. decide what behaviour will best suit his terminal and
b. instruct the PAD how to handle the terminal.

a. is a matter of reading and interpreting the specification of the terminal, b. is done by issuing instructions to the PAD.

There are facilities on the EMAS 2900 and EMAS-3 systems to automate both steps. These facilities are extended to help users who do not always use the same terminal, so that by using the TERMINALTYPE command everything is automatically set up to suit the particular model of terminal which you are using for the present session.

MESSAGE mode is designed to support the most basic facilities for interactive terminal use on the widest possible range of terminal types. This means that neither the user nor the software in the host needs to be aware of the type of the particular terminal nor of its detailed specification and special functions. It also means that the most limited and unsophisticated terminal can be used if necessary. Unfortunately it makes it extremely difficult (and sometimes impossible) to exercise many useful features on more advanced types of terminal.

Although the term PAD is generally taken to refer to some standard equipment, there are several varieties and differing models of each variety. The version being connected to EDNET is the CAMTEC JNT PAD. The behaviour of different manufacturer's types of PADs may differ in detail, and this Note cannot give a full specification.

You should refer to the manufacturer's documentation if you need detailed information. For CAMTEC PADs the relevant documents are available from ERCC and copies should be supplied for each terminal with a PAD connection. They consist of a summary and a 30 page *JNT PAD TERMINAL USER'S GUIDE.* If you read the guide, you will find that the PAD has a great many options, and among them is one specified as GREENBOOK NOGREENBOOK. This refers to a style of operation described in the 'Green Book', (Character Terminal Protocols on PSS. A recommendation on the use of X.3, X.28 and X.29 prepared by Study Group 3 of the British Telecom's PSS Users' Forum). You may need to know that PADs on EDNET are normally operated in GREENBOOK mode when you are using the the EMAS 2900 or EMAS-3 systems. NOGREENBOOK mode conforms more strictly to the recommendation X.3 of the international telecommunications body CCITT. Other codes such as X.25, X.28 and X.29 refer to CCITT recommendations on other aspects of network communication.

2. COMMANDS THAT CAN BE ISSUED LOCALLY AT THE PAD

2.1 BASIC RULES FOR USING YOUR TERMINAL

How to LOG-ON:

   a. press the RETURN key until the *PAD>* prompt appears,
   b. type CALL followed by the name of the host computer you want to use,
      for example,

   PAD> **CALL EMAS**

   c. after selecting the host you want, follow the normal procedure for
      getting onto that particular host. On the EMAS 2900 and EMAS-3
      systems, this means giving your user number after the *User:* prompt
      and your password after the *Pass:* prompt.

How to generate an interrupt:

   a. hold down the CTRL key and press P (this generates the DLE character),
   b. release the CTRL key and press the B key.

If you are connected to one of the hosts running EMAS 2900 or EMAS-3, the *Int:*
prompt will be printed on your terminal. You may reply with a valid interrupt
character, details of which can be found in Chapter 4 of the EMAS 2900 User's Guide
or Chapter 14 of the EMAS-3 User's Guide. See **CONTROLCHARINTS** in Section 4.3 for
a shorthand method of generating interrupts on EMAS-3.

How to break into the PAD from the host:

   - press the BREAK key (on some terminals you need to do this while
     holding down the SHIFT key), *or*
   - hold down the CTRL key and press P, then type A on its own.

This will produce the *PAD>* prompt on your terminal, after which you can issue any
local PAD command (see Sections 2.2 and 2.3).

How to abruptly break your connection with the host:

Break into the PAD from the host as described above and type **CLEAR** or **CLR** after the
PAD> prompt.

You would do this if you wanted to exit quickly from your interactive process.
This should only be done in extreme circumstances, for instance if there has been no
response from the host for at least two minutes, including responses to interrupt
requests, or if the terminal is responding with nonsense. Note that doing so may
leave your interactive process running so that you get a message saying *Process
Running* when you next try to log on. If this happens, inform the Operations Staff on
031-667 1081 ext. 2904, and ask them to log you off.

N.B. If your share a user number with another person be sure that if you get a
Process Running message it hasn't occurred because your colleague is logged on!

2.2 SELECTING MODES AT THE PAD

When your terminal is connected to one of the hosts on EDNET, it can be in one of three modes; MESSAGE, NATIVE and TRANSPARENT. These modes are fully described in the *JNT PAD TERMINAL USER'S GUIDE* which may be consulted at the ERCC Advisory service.

MESSAGE is the default mode while NATIVE and TRANSPARENT are for specialist use and are usually set from the host by a particular package (e.g. a graph drawing package or screen editor).

You can put your terminal in any of these modes by typing their names after the *PAD>* prompt. Remember if you are connected to a host, you must break into the PAD by using one of the methods described under **How to break into the PAD from the host** on the previous page. These modes would be selected locally at the PAD like this:

> *PAD>* **MESSAGE**
> *PAD>* **TRANSPARENT**
> *PAD>* **NATIVE**

If you try out these examples, re-select MESSAGE mode or your terminal may not respond properly in normal use.

2.3 OTHER LOCAL PAD COMMANDS

Altering the value of PAD parameters

The CAMTEC PAD has 18 parameters which are shown with their values in Appendix II. Of these, 2, 3, 4, 7, 8, 10, 13 and 15 can be altered. These control such things as the ECHOing of text on your screen, the folding of lines after a certain number of columns etc.

Some of these parameters have keywords which can be typed after the *PAD>* prompt, for example:

> *PAD>* **LFINSERT=4**

would alter parameter 13 which determines whether a line feed is inserted after a carriage return (see Appendix II).

Displaying PAD parameter values

If you wanted to display the values of the 18 PAD parameters, issue the PAR? command:

> *PAD>* **PAR?**

which would generate this type of response:

1:1, 2:1, 3:126, 4:0, 5:1, 6:1, 7:1, 8:0, 9:0, 10:0, 11:3, 12:1, 13:4, 14:0, 15:1,
16:127, 17:24, 18:18

Altering the values of your terminal's characteristics

There are other commands which can be used to alter the operating style of your terminal, for example:

> *PAD>* TABS EVERY 12

would mean that each time you pressed the TAB key on your terminal, the cursor or printing mechanism would move 12 horizontal spaces.

The GREENBOOK/NOGREENBOOK mode

As mentioned in the Introduction, PADs connected to EDNET run in GREENBOOK mode. More details on GREENBOOK and NOGREENBOOK are described in the *JNT PAD TERMINAL USER'S GUIDE*

To select NOGREENBOOK mode, you would issue the following command:

> *PAD>* NOGREENBOOK

and to re-select GREENBOOK, you would type:

> *PAD>* GREENBOOK

Displaying your terminal's MODES and CHARACTERISTICS

If you wanted to check the MODES and CHARACTERISTICS of your terminal, use the SHOW command like this:

> *PAD>* SHOW T

which would generate a response like this:

> *vdu nopage del break nohostbreak fullduplex noline-fold-bug nooutparity width=80*
> *height=24 crpad=0/0 lfpad=0 tabs=every 3 noprintmask noinparity notermtabs*
> *callsin banner stats terminal noautocall*
> *echo nohosttabs nocontrolchars host edit nogreenbook transparent nologhost*
> *nohostparity forward=126 breakaction=1 lfinsert=4 timeout=0*

For more details on local PAD commands, see the *JNT PAD TERMINAL USER'S GUIDE*

3. AUTOMATICALLY SETTING YOUR TERMINAL FROM THE HOST

3.1 TERMINALTYPE

You can use this EMAS command to tell the system the type of terminal you are using.

Most simple facilities will work adequately even if you do not use TERMINALTYPE, but some important facilities (e.g. HELP and VIEW) will work more effectively if you let the system know which type of terminal you are using.

The command can be issued on its own or with a parameter. On its own it gives you a menu of computer terminal types. For example:

Command: TERMINALTYPE

Terminals supported are

0 unspecified	*1 Hardcopy, width 72*
2 Hardcopy, width 80	*3 Hardcopy, width 132*
4 Unspecified Video	*5 ITT*
6 Perkin-Elmer	*7 Lynwood*
8 VT52	*9 Apple,Sirius,SuperBrain,Terak*
10 ADM-3A	*11 Visual 200*
12 VT105	*13 Hazeltine Esprit*
14 Hazeltine 1500	*15 Newbury*
16 Pericom	*17 Tektronix 4010*
18 IBM 3101	*19 Dacoll 242E*
20 Volker Craig 404	*21 ICL KDS7362*
22 Hazeltine Esprit II	*23 Hazeltine Esprit III*
24 ADM-5	*25 Visual 50 and 55*
26 Tektronix 4014	*27 Datatype X5A*
28 ANSI compatible	*29 BBC*

Please type the number of your terminal and press 'return'
Terminal:

Note that the above example is based on using the command on the EMAS 2900 system. On EMAS-3, the menu would be displayed in upper case and you would be prompted with *Type:* at the bottom.

If you select the number which corresponds to the type of terminal you are using, it will be put into a suitable MODE and given suitable values for its CHARACTERISTICS.

If you know the number of the type of terminal you are using, you can use it as the parameter for the TERMINALTYPE command. For example,

Command: TERMINALTYPE 13

would tell the system that you are using a Hazeltine Esprit terminal. On EMAS 2900 the above command would generate the following response:

Your terminal type is Hazeltine Esprit

On EMAS-3 the response would be:

Terminal: HAZELTINE ESPRIT

You can check which type of terminal you are using by giving ? (EMAS 2900) or = (EMAS-3) as the parameter to TERMINALTYPE. For example, on EMAS 2900:

Command: **TERMINALTYPE ?**
Your terminal type is Hazeltine Esprit

and on EMAS-3:

Command: **TERMINALTYPE =**
Terminal: HAZELTINE ESPRIT

You should also note that you only have to issue the TERMINALTYPE command once per terminal if you are using the EMAS-3 operating system. If you then continue to use the same terminal, the correct type of terminal will automatically be selected.

However, on EMAS 2900, if you want to automatically set up your process, you can issue the TTYINIT command from within your foreground start file. This method is described in Section 3.2 below.

3.2 TTYINIT

This command is only required on the EMAS 2900 system. It checks to see if you have previously used the TERMINALTYPE command on the terminal you are using. If you have, then that particular TERMINALTYPE is re-selected. If you have not, then the UNSPECIFIED type of terminal is selected. Note that you must use the TERMINALTYPE command once on a terminal before TTYINIT will work for that particular terminal.

It is most useful if you include it in your FSTARTFILE which is OBEYed each time you log into your EMAS 2900 interactive process. To do this, follow these steps:

    a. Create a file called START and edit the TTYINIT command into it by using an editor, like this:

        Command: **EDIT START**
        START is new file.
        Edit: **i/TTYINIT**
        /: /
        Edit: **E**

    b. Select the FSTARTFILE option, like this:

        Command: **OPTION FSTARTFILE=START**

    Subsequently each time you log-on, the TTYINIT command will be obeyed and display a message appropriate to the terminal you are using, for instance:

        Command: **TTYINIT**
        Your terminal type is Hazeltine Esprit

Notes on TTYINIT

    a. If you always log-on from the same terminal, you should use the
    TTYINIT command with an equals sign as its parameter, like this:

        Command: **TTYINIT** =

    This command uses less resources because it does not need to check
    on your terminal address or use the list of terminal types that may be
    in your profile (SS#PROFILE).

    b. If you use TTYINIT then you do not need to include any SETMODE or
    XMODE in your FSTARTFILE and you do not need to use
    OPTION ITWIDTH=n

3.3 TTYLIST

The TTYLIST command will display a list of the terminals on which you have
previously typed the TERMINALTYPE command. On EMAS 2900 the result is:

    Command: **TTYLIST**

      Address Type
      ------- ----
    00001500300112 Hazeltine Esprit II
    00001500300415 Datatype X5A
    00001500300400 Tektronix 4010
    00001500004615 Pericom

The 14 digit number in the above example is the network address of your terminal.

The format of the output on EMAS-3 is slightly different:

    Command: **TTYLIST**

22 HAZELTINE ESPRIT II	*00001500300112 30303030313530303330303313132*
13 HAZELTINE ESPRIT	*00001500000425 30303030313530303030303343235*
13 HAZELTINE ESPRIT	*00001500000410 30303030313530303030303343130*
13 HAZELTINE ESPRIT	*00001500000403 30303030313530303030303343033*
22 HAZELTINE ESPRIT II	*00001500000417 30303030313530303030303343137*

The above example gives:

    - the terminal type number,
    - the name of the terminal,
    - the network address,
    - the hexadecimal values of the digits which make up the network
      address.

If you are using the EMAS 2900 system, TTYLIST will only work if you have issued the
TTYINIT command (see Section 3.2) during that session. Also, on EMAS 2900 a
terminal will not be contained in the list unless TTYINIT was typed while using that
particular terminal.

4. ALTERING AND INTERROGATING YOUR TERMINAL FROM THE HOST

4.1 EMAS-3 - The SETMODE Command

The SETMODE command is used on EMAS-3 to instruct the PAD to alter your terminal's CHARACTERISTIC or MODE settings. These may have been previously set by the TERMINALTYPE command or they may have been given default values by the PAD.

The SETMODE command is used with two parameters:

      a. the KEYWORD for the CHARACTERISTIC or operating MODE e.g.
         WIDTH for the number of columns to be printed before a new line
         is taken, or MESSAGE for the mode of operation.

      b. the value for the CHARACTERISTIC e.g. WIDTH=132, or an optional
         value of ON or OFF for some of the MODES e.g. MESSAGE=OFF.

The keywords are described in Section 4.3.

Here are some examples of the SETMODE command:

        Command: SETMODE NATIVE
        Command: SETMODE WIDTH=120

Notes on the SETMODE command

      a. Typing the SETMODE command on its own will reset any PAD
         parameters to their default values (see Section 4.3).

      b. If you give an equals sign as the parameter, all the PAD parameters and
         there values will be displayed. For example:

            Command: SETMODE =
            P1=1,P2=1,P3=126,P4=0,P5=1,P6=1,P7=1,P8=0,P9=0,P10=80,P11=3,P12=0,P13=4,P14=0
            P15=1,P16=127,P17=24,P18=18,CONTROLCHARINTS

      c. Any MODE or CHARACTERISTIC you have altered will only be effective
         when you are running a program or using a package. They will be
         altered for the duration of the program or package and reset when it is
         complete. This means that any SETMODE command you issue after the
         EMAS *Command:* prompt will have no effect. However, you can try out
         the various SETMODE commands by issuing them from within an OBEY
         file (see HELP OBEY for more details) and checking the PAD parameters
         by following the SETMODE command with an equals sign (=). For
         example, if you created a file called SETTEST containing the following
         lines of text:

            SETMODE ECHO=OFF
            SETMODE =

         and you then typed

OBEY SETTEST

it would show P2 as having a value 0 which means echo is switched
off. If you were to issue these two SETMODE commands at command
level, P2 would be shown to have a value of 1, which would mean that
the SETMODE ECHO=OFF command had no effect.

d. You can use SETMODE with certain PAD parameter numbers to alter
your terminal's settings. This method is described in Section 4.4.

e. More than one keyword can be given in one SETMODE command.
For example,

Command: **SETMODE MESSAGE,WIDTH=132**

f. The keywords can be abbreviated to one or more letters. For example,

Command: **SETMODE M,W=132**

Note that you cannot abbreviate the NOECHO and
NOCONTROLCHARINTS keywords to the letter N as they coincide with
NATIVE. NATIVE can be abbreviated to N, NOECHO to NOE and
NOCONTROLCHARINTS to NOC.

4.2 EMAS 2900 – The XMODE Command

The XMODE command is used on EMAS 2900 to instruct the PAD to alter your
terminal's CHARACTERISTIC and MODE settings. The description in Section 4.1 for
SETMODE also applies to XMODE (except for the details given under **Notes on
SETMODE**). Here are some examples of the XMODE command:

Command: **XMODE MESSAGE**
Command: **XMODE WIDTH=132**
Command: **XMODE NOECHO**

As with SETMODE, the XMODE keywords are described in Section 4.3.

Notes on XMODE

a. You can use XMODE with certain PAD parameter numbers to alter your
terminal's settings. This method is described in Section 4.4.

b. More than one command can be issued on one line, for example:

Command: **XMODE WIDTH=132,MESSAGE**

c. The keywords can be abbreviated to one or more letters. For example:

Command: **XMODE W=132,M**

4.3 SETMODE AND XMODE KEYWORDS

The keywords for the SETMODE and XMODE commands are given below, and for simplicity, a standard set of subheadings is used.

Use	a brief description of what the keyword does.
How used	an illustration of how you would issue the SETMODE or XMODE command with that keyword.
Default setting/value	the value the PAD will give to that keyword, unless you tell it otherwise.
Limitations in use	whether it varies depending on the host, operating mode (GREENBOOK/NOGREENBOOK) etc.

CONTROLCHARINTS/NOCONTROLCHARINTS

Use

On EMAS-3 this keyword allows you to use the CTRL key plus another key to generate a particular interrupt. This is a shorthand form of the method described in Section 2.2 which tells you how to generate the *Int:* prompt on your terminal.

How used

The MODE is switched on like this:

> *Command:* SETMODE CONTROLCHARINTS

and switched off like this:

> *Command:* SETMODE NOCONTROLCHARINTS

It can also be switched off and on by using the =OFF or =ON parameter after the CONTROLCHARINTS keyword, e.g.

> *Command:* SETMODE CONTROLCHARINTS=ON

Once the mode is on, an interrupt can be generated by holding down the CTRL key and pressing the letter A, C, K or T. For example, holding down the CTRL key and pressing the letter A will generate an interrupt A. These single character interrupts are described in Section 14.6.3 of the EMAS-3 User's Guide. Note that CTRL-Q already has a different meaning and cannot be used to generate the equivalent of an interrupt Q.

Default setting/value

On EMAS-3, when your process is initiated, a file called SS#PROFILE is created. This file determines the way your process behaves and one of the things it controls is whether CONTROLCHARINTS is ON or OFF. By default it is ON, but this can be changed like this:

Command: **OPTION CONTROLCHARINTS=OFF**

or changed back to ON like this:

Command: **OPTION CONTROLCHARINTS=ON**

Note that when you change the default by using the OPTION command, the value you give remains the default until you change it with a subsequent OPTION command.

<u>Limitations in use</u>

Cannot be used on the EMAS 2900 system, therefore cannot be used with the XMODE command.

ECHO/NOECHO

<u>Use</u>

Controls the echoing of characters on your terminal. If you switch echoing off, any text you type at your terminal will be not be returned by the PAD.

<u>How used</u>

Command: **SETMODE NOECHO**	on EMAS-3
Command: **XMODE NOECHO**	on EMAS 2900

turns the echoing off.

If you type:

Command: **SETMODE ECHO**	on EMAS-3
Command: **XMODE ECHO**	on EMAS 2900

echoing will be switched back on.

<u>Default setting/value</u>

ON (ECHO). NOECHO is automatically selected by the host when it asks you to type your password after typing your user number. It is also selected when you use the PASSWORD command to alter any of your passwords.

<u>Limitations in use</u>

The NOECHO keyword cannot be abbreviated to a single letter as other keywords can. This is because the NATIVE keyword is selected if N is given as a parameter to SETMODE or XMODE. However, it can be abbreviated to NOE.

GRAPH

<u>Use</u>

Disables all format controls thus allowing all characters with numeric values between 0-255 to be sent to the terminal.

<u>How used</u>

       Command: **SETMODE GRAPH=ON** on EMAS-3
       Command: **XMODE GRAPH=ON**   on EMAS 2900

enters GRAPH mode,

       Command: **SETMODE GRAPH=OFF** on EMAS-3
       Command: **XMODE GRAPH=OFF**   on EMAS 2900

leaves GRAPH mode.

Preceding the GRAPH keyword with a minus sign will also take you out of GRAPH mode.

Note that when you de-select this mode, you will be put into MESSAGE mode.

<u>Default setting/value</u>

By default, GRAPH mode is switched off.

<u>Limitations in use</u>

It is only sensible to use this mode if your terminal has some built-in intelligence, i.e. a graphics terminal or microcomputer.

MESSAGE

<u>Use</u>

Puts your terminal into MESSAGE mode. In this mode input from your terminal to the host and output from the host to your terminal are interleaved. A fuller description is contained in the *JNT PAD TERMINAL USER'S GUIDE*

<u>How used</u>

To select MESSAGE mode you would type the following command:

       Command: **SETMODE MESSAGE**   on EMAS-3
       Command: **XMODE MESSAGE**   on EMAS 2900

To de-select MESSAGE mode you must select another mode, i.e. TRANSPARENT, GRAPH or NATIVE.

Default Setting/Value

On CAMTEC PADs connected to EDNET, the default operating mode is MESSAGE.

Limitations in use

In this mode intelligent terminals cannot exercise their useful facilities, they must act like an ordinary terminal (to utilize these facilities, use TRANSPARENT, GRAPH or NATIVE mode).

NATIVE

Use

Connects your terminal in NATIVE mode, which means that the PAD treats the input from the terminal and output from the host as independent streams of data. It performs no processing of the characters received from the terminal or from the host. Input from the terminal is forwarded to the host if no input is received for 1/20th of a second, or when the buffer is full.

How used

NATIVE mode is selected by typing:

>*Command:* **SETMODE NATIVE**   on EMAS-3
>*Command:* **XMODE NATIVE**   on EMAS 2900.

To de-select NATIVE mode, either precede the keyword with the minus sign (-NATIVE), or follow it with the OFF parameter (=OFF).

With NATIVE switched off, your terminal would be running in MESSAGE mode.

Another method of getting out of NATIVE mode is to select another mode, i.e. MESSAGE, TRANSPARENT or GRAPH.

Default setting/value

By default, NATIVE is switched off. It is usually switched on when required by software in the host and then switched off when that particular piece of software has completed its task.

Limitations in use

No local editing is available while in this mode, anything typed at your terminal will be forwarded to the host after 1/20th of a second. Escape sequences are not available except for the ones used to generate the local *PAD>* prompt (these are described under the heading **How to break into the PAD from the host** in Section 2.1).

TRANSPARENT

<u>Use</u>

This keyword is used to put your terminal into TRANSPARENT mode. While in this mode, input from the terminal is handled as for MESSAGE mode, the current line is held in the PAD and is available for local editing until a forwarding character is input.

However, output characters are transmitted to the terminal without any processing by the PAD and no line folding or padding is performed. The host is expected to control the terminal for itself.

GRAPH and TRANSPARENT are both the same as far as the PAD is concerned: they make the PAD send all the characters straight through to the terminal with no extra CRs or LFs inserted (e.g. long lines are not split in two and the host must send CR and LF at the end of each line). The difference is in the host: GRAPH treats the characters output by the user's program as binary data and sends them out to the PAD completely unchanged; but TRANSPARENT treats them as text, so that (for instance) the program can print LF at the end of each line and the support software in the host will add in a CR before the text is sent to the PAD.

<u>How used</u>

TRANSPARENT mode is selected like this:

       Command: SETMODE TRANSPARENT   on EMAS-3
       Command: XMODE TRANSPARENT   on EMAS 2900.

De-selection would be done by preceding the keyword by a minus sign or following it by the =OFF parameter (this will put your terminal into MESSAGE mode). It can also be done by selecting another mode (MESSAGE, GRAPH or NATIVE). Note that de-selection will put you into MESSAGE mode.

<u>Default setting/value</u>

By default, TRANSPARENT mode is switched off and your terminal will run in MESSAGE mode.

<u>Limitations in use</u>

This mode is only useful if it is selected while using a suitable terminal (i.e. a graphics terminal or microcomputer).

FORWARD

<u>Use</u>

Selects the characters which when typed on your terminal will send the previously typed text to the host.

How used

It takes a decimal number as its parameter which is the sum of the valid values (see parameter 3 in the table in Appendix II). For example:

Command: **SETMODE FORWARD=126** on EMAS-3
Command: **XMODE FORWARD=126** on EMAS 2900

would forward text to the host after you type any character from the EMAS Internal character set (see Appendix I) with a value between 1 and 31 (CR to US).

Default setting/value

The default setting is 18, which means that data will be forwarded to the host after you have typed the CR, ETX or EOT character.

Limitations in use

If your terminal is in NATIVE mode then forwarding is done after 1/20th of a second.

TIMEOUT

Use

Controls the timeout period after which the PAD forwards user typed input to the host. The parameter must be in the range 0 to 255, where a value of one equals 50 milliseconds or 1/20th of a second. If the value 0 is given, then forwarding on timeout is disabled.

How used

TIMEOUT would be set like this:

Command: **SETMODE TIMEOUT=100** on EMAS-3
Command: **XMODE TIMEOUT=100** on EMAS 2900.

Default value/setting

By default, timeout is set to 0.

Limitations in use

It can only be set if NOGREENBOOK mode is set with either MESSAGE or TRANSPARENT mode. If NATIVE mode is selected, then TIMEOUT occurs after 1/20th of a second (i.e TIMEOUT is set to 1).

WIDTH

Use

Sets a limit on the number of characters (including spaces) you can type on your terminal before the text folds over to a new line.

How used

        Command: **SETMODE WIDTH=132** on EMAS-3
        Command: **XMODE WIDTH=132**   on EMAS 2900

would set the line width to 132 columns.

Default setting/value

By default, this PAD parameter is given a value of 80.

Limitations in use

This value can only be set if you are operating in NOGREENBOOK mode. It must lie between 15 and 132.

4.4 USING PAD PARAMETER NUMBERS AS KEYWORDS

The XMODE and SETMODE commands do not have keywords for all the CHARACTERISTIC and MODE settings that can be altered or set on a PAD. If you look at the table in Appendix II headed **CHARACTERISTIC and MODE settings for PADs,** you will see that there are 18 settings, not all of which have XMODE or SETMODE keywords. To get round this problem, you can use the PAD parameter number as the keyword with the appropriate numeric value as its parameter. Both the commands would be given in this form,

        Command: **SETMODE Pp=v**

where **p** is the parameter number and **v** is the value of the parameter.

Both examples in this section use the **XMODE** command although using **SETMODE** with the same parameters would have the same effect.

As an example, take PAD parameter 2. This is used to control the echoing of text at your terminal. By default it has a value of 1 which means that echoing is switched on. You can switch echoing off by giving parameter 2 a value of 0 like this:

        Command: **SETMODE P2=0**

Not all the parameters described in the table in Appendix II can be changed by the host. If you are in GREENBOOK mode you can change the parameters 2, 3, 7, 8 and 13. If you are in NOGREENBOOK mode you can change parameters 2, 3, 4, 7, 8, 10, 13 and 15. Parameters 9 and 14 can only be set at the PAD. You should note that PADs on the Edinburgh network normally operate in GREENBOOK mode. See Section 2.3 for details on checking the settings of these PAD parameters.

4.5 DISPLAYX3

This command prints out all the PAD parameter numbers and their settings.
The output is the same as could be given as a parameter to the XMODE command.
For example:

> *Command:* **DISPLAYX3**
> *P1=1,P2=1,P3=126,P4=0,P5=1,P6=1,P7=1,P8=0,P9=0,P10=50,P11=3,P12=1,*
> *P13=4,P14=0,P15=1,P16=127,P17=24,P18=18*

Note that this command can only be used on EMAS 2900.

On EMAS-3 these values would be displayed by issuing the SETMODE command with
an equals sign as its parameter. For example:

> *Command:* **SETMODE** =

5. CONTROLLING YOUR TERMINAL FROM A PROGRAM

This section describes routines and functions which can be called from a program to store or display selected values of your terminal's CHARACTERISTICS and MODE settings.

If you want a complete package for controlling your terminal, ask the ERCC Advisory service about the Simple Screen Management Protocol (SSMP). This is being implemented on EMAS-3 and will hopefully be in service during the academic year 1986/87. It was designed and implemented by Alan Hunter of the Computer Laboratory of the University of Newcastle under contract for the UK Joint Network Team (JNT). Copies of this draft specification are available from:

> Joint Network Team,
> c/o Rutherford Appleton Laboratory,
> Chilton,
> Didcot,
> Oxfordshire OXH OQX.

5.1 VDUI, EMAS3VDUI

You can find out details of certain terminal CHARACTERISTICS by using one of these utilities.

On EMAS 2900 the VDUI function would be specified in an IMP program like this:

    %external %integer %fn %spec VDUI (%integer n)

while on EMAS-3 it would be specified like this:

    %external %integer %fn %spec VDUI %alias "S#VDUI" (%integer n)

However, on EMAS-3 you are recommended to use the language independent procedure EMAS3VDUI. Its specifications in IMP, Fortran and Pascal are given below.

IMP: %external %routine %spec EMAS3VDUI (%integer %name N, VALUE)

Fortran: INTEGER value
                :
                CALL EMAS3VDUI (n, value)

Pascal: procedure EMAS3VDUI (var n, value: integer);
                    extern; emas;

Both take a number from 1 to 4 as the parameter 'n'. The parameter 'value' corresponds to certain terminal CHARACTERISTICS as follows:

> 1 = terminaltype number,
> 2 = columns per page,
> 3 = lines per page,
> 4 = ASCII code for the interrupt character.

5.2 VDUB, EMAS3VDUB

These utilities return a value in boolean form which gives details of one of your terminal's characteristics.

On EMAS 2900, the IMP function would be specified in an IMP program like this:

%external %integer %fn %spec VDUB (%integer n)

On EMAS-3 it would be like this:

%external %integer %fn %spec VDUB %alias "S#VDUB" (%integer n)

On EMAS-3 you can use the language independent routine EMAS3VDUB. It would be specified in IMP, Fortran and Pascal programs like this:

IMP: %external %routine %spec EMAS3VDUB (%integer %name n, value)

Fortran: INTEGER value
:
CALL EMAS3VDUB (n, value)

Pascal: procedure EMAS3VDUB (var n, value: integer);
extern; emas;

Both take an integer as parameter 'n'. Depending on the number you give as the parameter, a certain question will be asked about your terminal's modes. The result of the query is returned either as the value of the function or via the parameter 'value'. A result of 0 means 'no' or 'false', and a result of 1 means 'yes' or 'true'. A result of −1 means an error. The values of 'n' and corresponding enquiries are as follows:

1 – does the home key move the cursor to the top of the screen?
2 – does the terminal operate in page mode?
4 – does the terminal wrap text around at the end of a line?

5.3 VDUC, EMAS3VDUC

These utilities return a character string which, if sent to the terminal, will move the cursor to specified co-ordinates. A null result indicates that the terminal is incapable of controlled cursor positioning. The IMP function is specified like this on EMAS 2900:

%external %string %function %spec VDUC (%integer x,y)

and like this on EMAS-3:

%external %string %fn %spec VDUC %alias "S#VDUC" (%integer x,y)

and the EMAS-3 language independent routine is specified as follows:

IMP: %external %routine %spec EMAS3VDUC (%integer %name x, y,
%string (*) %name chars, %integer %name len)

```
Fortran:        INTEGER len
                CHARACTER*31 chars
                :
                CALL EMAS3VDUC (x, y, chars, len)

Pascal:         procedure EMAS3VDUC (var x, y: integer; readonly chars:
                                     packed array [l1..u1: integer] of char;
                                     var len: integer);
                extern; emas;
```

The parameters 'x' and 'y' are the X and Y co-ordinates. These are the column and line positions respectively. The values have an origin of zero (i.e. the top left hand corner is 0,0). The character string is returned either as the value of the function (VDUC) or via the variable CHARS, containing LEN significant characters (EMAS3VDUC). Since the string may contain non-printing characters then to print it from IMP on EMAS 2900 the PRINTCHS routine must be used. (PRINTSTRING on EMAS 2900 will only print ISO characters whose codes are in the range 32-126 and 26. PRINTSTRING on EMAS-3 will print any character.) The specification for PRINTCHS on EMAS 2900 is:

```
        %external %routine %spec PRINTCHS(%string(255) s)
```

For compatibility PRINTCHS is also provided on EMAS-3 even though its effect is the same as that of PRINTSTRING:

```
        %external %routine %spec PRINTCHS %alias "S#PRINTCHS" (%string(255) s)
```

5.4 VDUS, EMAS3VDUS

These utilities will return a character string. Sometimes this contains a name, but usually it is a value which must be printed to achieve a particular effect on your terminal. If an empty string string is returned then the operation is not supported by your terminal. Note that from an IMP program on EMAS 2900 the string will have to be printed using PRINTCHS. On EMAS 2900, the IMP function is specified as follows:

```
        %external %string %fn %spec vdus(%integer n)
```

On EMAS-3 it is specified like this:

```
        %external %string %fn %spec vdus %alias "S#VDUS" (%integer x)
```

The EMAS-3 language independent version is specified like this:

```
IMP:            %external %routine %spec EMAS3VDUS (%integer %name n,
                %string (*) %name chars, %integer %name len)

Fortran:        INTEGER len
                CHARACTER*31 chars
                :
                CALL EMAS3VDUS(n, chars, len)
```

```
Pascal:          procedure EMAS3VDUS (var n: integer; readonly chars:
                             packed array [l1..u1: integer] of char;
                             var len: integer);
            extern; emas;
```

Possible values of the parameter 'n' and the meaning of the corresponding returned
string 'chars' (of significant length 'len') are shown below:

        0 - prints the name of your type of terminal,
        1 - clears your screen,
        2 - moves the cursor home,
        3 - clears to end of line,
        4 - clears to end of screen,
        5 - initialises terminal,
        6 - moves cursor up,
        7 - moves cursor down,
        8 - moves cursor left,
        9 - moves cursor right,
        10 - inserts a line,
        11 - deletes a line,
        12 - sets your terminal into page mode,
        13 - sets your terminal into roll mode,
        16 - displays two character Unix name for terminal type,
        17 - starts standout mode,
        18 - ends standout mode.

5.5 MODESTR, EMAS3MODESTR

With these two utilities you can print or store a character string of the modes your
terminal has set. The string is returned in a format suitable for passing as a
parameter to the SETMODE and XMODE commands. The IMP function MODESTR can
be used on both the EMAS 2900 and the EMAS-3 systems while the language
independent routine EMAS3MODESTR can only be used on EMAS-3.

On EMAS 2900 MODESTR would be specified in an IMP program like this:

        %external %string %fn %spec MODESTR

On EMAS-3 it would be specified like this:

        %external %string %fn %spec MODESTR %alias "S#MODESTR"

The language independent routine EMAS3MODESTR is specified as:

IMP: %external %routine %spec EMAS3MODESTR (%string (*) %name CHARS
             %integer %name len)

Fortran: INTEGER len
             CHARACTER*255 chars
                  :
             CALL EMAS3MODESTR(chars,len)

Pascal: **procedure** EMAS3MODESTR(**readonly** chars: **packed array**
                      [l1..u1:integer] of char;
                      var len: integer);
        extern; emas;

The parameter 'chars' returns the modes and characteristics as a character string.
For convenience, the number of significant characters, i.e. not including trailing
spaces, is returned in the parameter 'len'.

5.6 Notes on EMAS-3 Language Independent Routines

When calling the EMAS3VDUx routines from Fortran and Pascal on EMAS-3 there are
various points to be careful about.

Fortran

The character string values returned from the routines EMAS3VDUC and EMAS3VDUS
will be padded out with extra spaces which probably should not be printed. The extra
parameter 'len' says how many characters are actually significant. The expression you
should use in a WRITE statement to achieve the desired effect (cursor positioning,
clearing screen or whatever) is therefore 'chars(1:len)' rather than just 'chars' and you
should use the FORMAT edit descriptor A (rather than A4 or A anything else) so that
the right number of characters are output. Extra spaces would of course move the
screen cursor to the right of where you have tried to position it with the call to
EMAS3VDUC. You should also remember that when directing formatted output to the
screen the first character of any record is intercepted and used as a format effector.
You should therefore add an innocuous character to the beginning of your FORMAT
statement so that the first character of 'chars' is not intercepted. These points are
illustrated in the following program fragment:

```
          CHARACTER*31 chars
          INTEGER iflag, len
             :
    C     set the mode to 'graph'
          CALL EMAS3SETMODE ('graph', iflag)
    C     now move the cursor to the middle of the screen (40,12)
    C     (assuming an 80 by 24 screen - we could get the actual numbers
    C     from EMAS3VDUI of course)
          CALL EMAS3VDUC (40, 12, chars, len)
          WRITE (6,100) chars (1:len)
    100   FORMAT (' ', A, '* <-- here it is')
             :
```

Note also that Fortran output normally adds a carriage return and line feed to the end
of each record. This means that any attempt to write to the bottom line of the screen
will probably result in the screen scrolling and previous output being displaced.

Pascal

The main point of note about calling the EMAS3VDUx commands from Pascal on EMAS-3 is the method of specifying the procedure. Note the use of the statement **emas** to note that this is a Subsystem routine, and also the peculiar use of the parameter type **readonly** for character string variables which are in fact going to have values written into them. As with Fortran the returned string is very likely to have superfluous trailing spaces so the parameter 'len' should be used to print out only the significant characters. Note also that all the integer parameters are **var** type. This means that you cannot pass integer constants as parameters, the values must be assigned to variables first. This Pascal example is similar to the Fortran one.

```
program pvdutest(output);
    var x, y, flag, len, i: integer;
        chars: packed array [1..31] of char;
    procedure    emas3setmode(readonly s:packed array [l1..u1: integer] of char;
                              var flag:integer);
        extern; emas;
    procedure       emas3vduc(var x, y: integer;
                              readonly chars: packed array [l1..u1: integer] of char;
                              var len: integer);
        extern;  emas;

    begin
        emas3setmode('graph', flag);        {very lax not to check the flag here...    }
        x := 40; y := 12;                   {N.B. need to put coordinates in variables }
                                            {     since they are var parameters         }
        emas3vduc(x, y, chars, len);
        for i := 1 to len do write (chars[i]);  {print out len characters              }
        write('* <-- Here It Is');          {and put out a message                     }
    end.
```

I. CHARACTER CODES

The table below shows the internal ISO character codes used by the EMAS operating system.

0	NUL	32	space	64	@	96	'
1	SOH	33	!	65	A	97	a
2	STX	34	"	66	B	98	b
3	ETX	35	(£) £	67	C	99	c
4	EOT	36	$	68	D	100	d
5	ENQ	37	%	69	E	101	e
6	ACK	38	&	70	F	102	f
7	BEL	39	'	71	G	103	g
8	BS	40	(	72	H	104	h
9	HT	41	)	73	I	105	i
10	LF	42	*	74	J	106	j
11	VT	43	+	75	K	107	k
12	FF	44	,	76	L	108	l
13	CR	45	−	77	M	109	m
14	SO	46	.	78	N	110	n
15	SI	47	/	79	O	111	o
16	DLE	48	0	80	P	112	p
17	DC1	49	1	81	Q	113	q
18	DC2	50	2	82	R	114	r
19	DC3	51	3	83	S	115	s
20	DC4	52	4	84	T	116	t
21	NAK	53	5	85	U	117	u
22	SYN	54	6	86	V	118	v
23	ETB	55	7	87	W	119	w
24	CAN	56	8	88	X	120	x
25	EM	57	9	89	Y	121	y
26	SUB	58	:	90	Z	122	z
27	ESC	59	;	91	[	123	{
28	FS	60	<	92	\	124		
29	GS	61	=	93	]	125	}
30	RS	62	>	94	.	126	~
31	US	63	?	95	_	127	DEL

I.I. NOTES ON CHARACTER CODES

The way a character is represented on your terminal can vary depending on the type.

The code values 128–255 are not associated with graphical or control characters within EMAS. However, codes which are in this range are not modified in any way and can thus be used when sending character information to remote terminals or processors by means of a communications network.

Consult your local Advisory service for information about the character sets supported by local communication networks, and the facilities available for communicating between a device or machine and another mainframe on such a network.

I.II. SPECIAL CONTROL CHARACTERS

The characters numbered 0 to 31 in the table on the previous page have special control functions. Some have their own control keys, but they can all be generated by holding down the CTRL key and typing a certain character.

The effect of holding down the CTRL key is to subtract the number 64 from the value of the ISO character you type. For example, if you hold down the CTRL key and type the letter A (which has an ISO Code value of 65) the value you are left with is 1. If you look at the table on the previous page, you will see that the ISO character code value 1 represents the SOH character. Control characters (code values 0 to 31) may be treated specially within EMAS and as they pass through the network. If you want to transmit them unchanged from the host to a terminal, you will need to use GRAPH mode (set by SETMODE or XMODE), and if you are generating them from an IMP program you should use the PRINTCH and PRINTCHS routines to output them. You should use PRINTCH and PRINTCHS also if you want to transmit code values 127 to 255, but you do not need graph mode.

Characters with code values in the range 32 to 127 are normally transmitted unchanged through all communications facilities, and are also handled within EMAS without any translation or conversion.

II. CHARACTERISTIC and MODE settings for PADs

Parameter reference number	Parameter Function	Valid Parameter Values	Value Function and SETMODE/XMODE keyword
1	Escape from Data Transfer	0	Escape off
		1	Escape on
2	Echo	0	Echo off keyword is NOECHO
		1	Echo on keyword is ECHO
3	Data Forwarding Characters		keyword is FORWARD
		0	None
		1	A-Z, a-z, 0-9
	Note. Values given may be summed in order to achieve a combination of functions. e.g. 126 - All characters between NULL and US of INTERNATIONAL ALPHABET No 5 (IA5)	2	CR
		4	ESC, BEL, END, ACK
		8	DEL, CAN, DC2
		16	ETX, EOT
		32	HT, LF, VT, FF
		64	All characters between NUL and US of IA5 not included above
4	Data Forwarding Timeout		keyword is TIMEOUT
		0	None
		1-255	1-255 X 1/20 seconds timeout
5	Ancillary device control	0	Control off
		1	Control on
6	Suppression of PAD service signals	0	Suppression off
		1	Suppression on

7	Action of PAD on receipt of the Break Signal from DTE-C	0	No action
		1	PAD transmits INTERRUPT packet
		2	PAD transmits RESET packet
		5	PAD transmits INTERRUPT packet and indication of BREAK pad message
		8	PAD escapes from Data Transfer state
		21	PAD transmits INTERRUPT packet and and indication of break PAD messages. Sets PAD parameter 8 to 1.
8	Suppression of data delivery to DTE-C	0	Suppression off
		1	Suppression on
9	Padding after CR	0	Terminal speed dependent
		1-7	1-7 padding characters
10	Line folding		keyword is WIDTH
		0	No line folding
		1-255	Line folding after 1-255 characters
11	Terminal speed (a read only parameter)	0	110 bit/s
		2	300 bit/s
		3	1200/1200 bit/s
		11	1200/75 bit/s
12	Flow control by DTE-C	0	Flow control off
		1	Flow control on

13	Line feed insertion after carriage return	0	No line feed insertion
		1	LF inserted after CR from DTE-P
		4	LF inserted after CR echoed DTE-C
		5	As for value 1 + value 4
		6	As for value Value 4 also LF inserted in data transmitted to DTE-P
		7	As for Value 1 + Value 6
14	Padding inserted after line feed character	0	No padding inserted
		1-7	1-7 padding characters after LF inserted
15	Editing	0	Editing off
		1	Editing on
16	Character delete character	0	Character delete off
		1-255	Decimal code of delete character
17	Buffer Delete character	0	Buffer display off
		1-255	Decimal code of buffer delete character
18	Buffer display character	0	Buffer display off
		1-255	Decimal code of buffer display character