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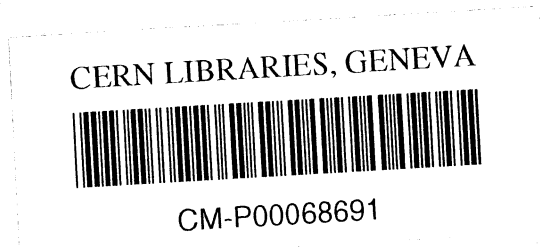
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United Kingdom Atomic Energy Authority

HARWELL

HANS Users Manual

Compiled by R. C. F. McLatchie
Computer Science and Systems Division
AERE Harwell, Oxfordshire
July 1980



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Preface

Second Edition – Version 1

This edition is a major revision of AERE–R9525–0 which is now obsolete.

The main changes in this version are:

- HANS Controls have been changed and extended to match ISO standards and to provide for future growth
- The CONNECT command has been re-designed for greater generality
- Features of the TERMINAL command have been changed
- Provisional details of the MESSAGE service have been added with consequent changes in ACCEPT and SEND

Minor corrections occur throughout the manual which should be reviewed in its entirety.

This manual describes the facilities of the second stage of Harwell Access Network Services (HANS). Note that not all of the commands and services will be available in early releases of HANS; information about these is included here for future reference.

Acknowledgements

HANS is the work of many people, too many to list in full here. The principal contributors were (in alphabetical order):

Ms H. F. Baldock (SCICON), R.J. Dewey, D.J. Dunstan (CAP), D. Eakin (SCICON), G. Heaton (CAP), D.W. Holbrough, N. Kimberley (CAP), Mrs C. Lockwood (CAP), A. Langsford, R.C.F. McLatchie, F. Milsom (CAP), I.A.G. Snowball, W. Teasdale, P. Toye (SCICON), D. Wallace.

We also thank early users of the system for their patience, understanding and constructive criticism.

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1. Introduction to HANS

HANS (Harwell Access Network Services) is a packet-switched computer network that links terminals and other devices that use the ASCII variant of the International Alphabet Number 5 (IA5) character code (see 7.3), to a variety of computer services. Your terminal is either permanently connected to HANS or it can be dialled in to HANS using the public telephone system. HANS provides two kinds of service:

- (i) *Host Services* – HANS provides *access* to a number of services offered by the service computers (known as *service hosts*) attached to HANS e.g. HUW, TSO, APL etc.. These services are called *host services*.
- (ii) *HANS Services* – Services provided by the HANS network itself to make the use of your terminal on any host service as easy and convenient as possible. Normally *HANS Service* will be abbreviated to *HANS*. When we say: '*HANS allows you to ...*', we should, strictly speaking, have said: '*There is a HANS Service that allows you to*'. It is natural for a user to identify the network with the services it provides and this simplification will be used throughout this manual. HANS Services are obtained by issuing commands or entering control characters (see below).

We will usually abbreviate *host service* to *service*, and *HANS service* to *HANS*.

HANS service is available to your terminal for the whole of the time you are connected to the network. You use HANS to access the particular host service of your choice. Once contact has been made with a host service you communicate directly with that service. By taking special action you can use a HANS control or command while you are in contact with a service. After each HANS command, you automatically return to direct communication with the service. When you disconnect from a service you normally remain connected to HANS for a further period of about one minute. This will enable you to access another service without having to re-establish contact with HANS. If you do not use any HANS facility in this time, you will be disconnected automatically.

As you see, HANS provides basic support underlying all the other services available on the network. You will need to know how to use HANS facilities for connecting to and disconnecting from a service. These are described in section 2. An introduction to all the other HANS facilities is provided in section 2.6, and a full introduction to these facilities is given in sections 3 and 4. Section 7 is a reference guide to all HANS facilities.

Naturally you also need to know how to use any particular service you select. The details vary from service to service so they cannot be given in this manual. You must refer to the user manual for each service for these details. For your convenience brief descriptions of some of the most commonly used services available on HANS are given in Section 5.

There are some general information and communication services available on HANS. Although these are, strictly speaking, host services, their use is so closely related to the use of HANS that it is appropriate to describe them in this manual. This is done in section 6.

2. Basic HANS Facilities

2.1 Connecting to HANS

If you have a dial-up terminal, dial the HANS telephone number you have been given. The telephone will be answered automatically by HANS. Switch to data mode as soon as you hear the continuous carrier signal. Proceed as for permanently connected terminals.

To call HANS, enter the HANS *enquiry* character by holding down the control key (probably marked CTRL) while you press 'E' (upper case e).

Throughout the rest of this manual this action will be described as entering the HANS *enquiry* character, or entering *enquiry*. Enter *enquiry*, repeatedly, if necessary, until HANS responds by sending you a message of the form:

```
HARWELL NETWORK SERVICES>
```

A message of this type is called a *prompt*; its purpose is to *prompt* you to supply input. Any message from HANS that ends with > is a prompt; HANS expects a message from you in reply. *Enquiry* has, in effect, acted as a *logon command* to HANS; you are now *in session* with HANS. During the session whenever you enter *enquiry*, HANS will issue a prompt for input. These prompts will be of the form:

```
HANS>
```

The full title *Harwell Network Services*, is used for the first prompt of a session only. If you do see the full title *Harwell Network Services* in a prompt from HANS, it indicates that your session has been restarted.

You should only need to enter *enquiry* more than once at the start of a HANS session if you are connected by means of a switched line (e.g. by telephone, or by port selector). The repeated *enquiry* allows HANS to detect the transmission speed of your terminal automatically. If repeated *enquiries* do not produce the HARWELL NETWORK SERVICES message, press the BREAK key, switch your terminal to a lower speed and try again.

2.2 Connecting to a Host Service

To access a particular service simply enter:

```
HANS> service-name
```

where *service-name* is the actual name of the service that you want to use. End the line with a carriage return.

If HANS is able to connect you to the service, you will get a prompt from the service inviting

you to logon. The form of the prompt depends on the service you have selected. For example the HUW service will send:

USER IDENTIFIER:

while IBM services might issue prompts of the form:

ENTER LOGON –

The fact that you receive a logon prompt confirms that the selected service is active and is prepared to accept your logon bid. If HANS is unable to provide access to the service you name, it outputs the message

HANS: *service-name* , SERVICE NAME NOT KNOWN

in the case where HANS does not recognise the service name, or

HANS: *service-name* IS UNOBTAINABLE

in the case where HANS does recognise the service name but there is currently no active access to the service, or

HANS: *service-name* SERVICE IS BUSY , TRY AGAIN LATER

in the case where active access to the service is available but the service is currently unable to accept further logon bids. Note: the identification 'HANS: ' appears in these messages to show that they were produced by HANS.

To speed up the logon you can supply logon details for the host service at connect time as follows:

HANS> *service-name* 'logon-text'

Note that the logon text must appear between single quote characters. For example,

HANS> huw '*uid password account-number*'

or

HANS> tso 'logon *uid/password pr (proc-name) . . .*'

In these cases you will be logged on to the service without further prompting – provided, of course, that the logon details are complete and correct.

2.3 Disconnecting from a Host Service

You can disconnect your terminal from a host service in one of three ways:

- a) by entering the appropriate logoff command for the host service to which you are logged on;

- b) by pressing the BREAK key on (or breaking the line connection of) your terminal;
- c) by calling HANS (enter *enquiry*) and issuing the DISCONNECT command:

```
HANS>disconnect
```

Method (a) is the preferred method since it will cause you to be prompted to complete any unfinished business you may have with the host service before disconnecting your terminal. Method (b) is more drastic and can be used if method (a) fails to work. Method (c) is similar in its effects to method (b) but can be used from terminals that do not have a BREAK key or a convenient means of interrupting the line connection.

Note that on dial-up terminals the effect of clearing down the call (e.g. by replacing the receiver) is to force a disconnection by method (b); it will also disconnect your terminal immediately from HANS.

2.4 Disconnecting from HANS

After the last message from the service, your terminal will remain in session with HANS for a further period of about one minute. If you do not enter *enquiry* before this time elapses, you will automatically be disconnected from HANS. If your terminal is on a switched line (e.g. connected via the telephone system or on the Harwell Port Selector), the line will be cleared down when you are disconnected from HANS.

If you press the BREAK key (or break the line connection) at any time when you are *not* connected to a host service, you will be disconnected from HANS immediately. Pressing the BREAK key *twice* while you are connected to a host service will disconnect you from both the service and HANS.

2.5 HANS Conventions

Messages A *message* is a string of characters ending with a predefined *end of message* character. By default HANS will assume that *carriage return* is the *end of message* character. You may alter this default by using the HANS TERMINAL command (see section 3). The *message* is the basic unit of information interchange on HANS. The dialogue you have with a service is an exchange of messages. Naturally you have to be aware of the requirements of the service; it is pointless to send a message of 80 or 120 characters (say) if the service itself can only deal with messages of up to 72 characters.

Message Structure Messages may be built up from *lines* of characters. A *line* is a string of characters of predefined length or ending with a predefined *end of line* character. You can select an *end of line* character using the HANS TERMINAL command. The (maximum) length of any line is

set by means of the *Line-Length* parameter of the HANS TERMINAL command; the default value for *Line-Length* is 72.

If you define the *end of line* character to be identical to the *end of message* character, every message you enter consists of one and only one line; output messages may, however, contain several lines. If you define the *end of line* character to be different from the *end of message* character, both input and output messages can contain several lines. In this case, after each line in an input message, HANS will continue reading until the *end of message* character is entered.

Line Sets To make the output of messages as efficient as possible HANS will group output lines in a message into *line sets*. A *line set* is a sequence of contiguous lines from a message that can be held within a single output buffer store. The size of this buffer is determined by the nature of the terminal and the service you are using. You do not normally have to be concerned about the buffer size since it has no effect on message or line structures. But control of output (see 3.3) takes effect at line set end. Where you request output finish or suspension by entering the appropriate control character, output may be stopped or suspended in mid line. If suspension is controlled by HANS, it will always occur at the end of a line.

Terminal Type In the present version of HANS only one general type of terminal is supported – the line terminal. A line terminal may be used to construct or receive a message that runs over several lines of text but it does so one line at a time. The line of a message to which you are actively adding characters is known as the *current line* of that message. The HANS editing facilities described below, apply to the current line only. Once a completed line has been entered you are no longer able to change its contents by means of HANS facilities; you may be able to change the contents using host service editing facilities once the completed message has been received by that service.

Echoing By default HANS will expect your terminal to run in *full duplex mode*; i.e. HANS will send a copy of each character received from your keyboard back to your terminal. This is called *echoing*. It provides a check on the accuracy of transmission; if the character you get back from HANS is not the character you sent, there has been a transmission error. It also provides direct confirmation that input is expected. HANS can receive characters at any time. However the characters received are not echoed to your terminal unless or until either HANS or a host service has requested input.

Type Ahead A buffer store of 16 characters is used (cyclically) to hold the input characters from your terminal before they are echoed. As each character is echoed, the space it occupied becomes available for type ahead storage. If your input line is short compared with the buffer size, several lines can be input ahead of echo. If you enter too many

characters for the type-ahead buffer, new characters (i.e. the most recent ones) will be lost without warning. You will, of course, eventually see that they are missing when echoing reaches this point.

Full Duplex Terminal Working Many terminals have keys to select full duplex (FDX) or half duplex (HDX) working. Select full duplex for use with HANS if you can. If only half duplex is available, each character will be displayed twice (once by the terminal itself, once on echo from HANS). The Echo option of the TERMINAL command can be used to turn the HANS echo off (see section 4.4).

Half Duplex Message Exchange If your terminal is connected over HANS using *half duplex message exchange*, then the input you provide and the output of replies to each of these from the service must alternate (*flip-flop*). Before you can send a second message to the service, you must wait for the output of the response to the previous input message. HANS, however, allows you to begin typing in a second message (typing ahead – see above) as soon as the first message is complete, but the characters of this second message will not be echoed to your terminal until the service is prepared to accept the second message. This will only occur after the output response to the previous input message has been displayed on your terminal. HANS will store the characters you type ahead up to the limit of available buffer space (16 characters). As always, your guarantee that the characters you type have been received correctly and will be sent to the service is that you have seen them echoed by HANS at the terminal.

The HUW service on HANS uses half duplex message exchange.

Full Duplex Message Exchange If your terminal is connected over HANS using *full duplex message exchange*, then the input and the output of messages are independent of each other and can continue simultaneously. You may begin entering a second message as soon as entry of the first message is complete and without waiting for the service to respond to the first message. Apart from the possibility of a short delay (normally less than the time you take to type in one or two characters) the characters of a second input message will be echoed to your terminal as soon as they are entered. This confirms that further input is allowed. If the service has an output message for you while you are typing in a subsequent message, it will be displayed by *breaking through* your input; the output message will appear, starting on a new line, and this will be followed by a repeat of the current line of the input message up to the point of break through interruption. You then continue entering the message. You can even continue entering characters during output provided that you do not exceed the capacity of the type-ahead buffer (16 characters). As always, if you can see input characters echoed at your terminal, you are allowed to enter input.

Most of the IBM services available on HANS use full duplex message exchange. This is a feature of the way in which HANS has chosen to support a given service, not a feature of the service as such.

One feature of full duplex message exchange that you should be aware of is that it is not possible, at present, for HANS to honour a request from a service to inhibit echo for a given prompt. For instance, when a service prompts for a *password*, it is normal for echoing to be inhibited until the password has been entered. The problem arises because, in full duplex message exchange, HANS allows you to begin entering the next input message *before* the service prompt with its request for *echo off*, arrives. In these cases, the *echo off* request is ignored. You can, however, use a HANS control (see 3.5) to turn echo off for yourself if necessary.

Error Correction for Messages

HANS automatically checks for transmission errors while a message is being transmitted on the network, and will correct errors, if possible, before delivering the message to the service or to you. If the errors cannot be corrected, the sender will be informed of the failure. If one of your messages fails to reach a host service, you will receive a message of the form:

HANS: UNABLE TO TRANSMIT MESSAGE TO SERVICE

or

HANS: MESSAGE TO SERVICE PARTIALLY TRANSMITTED

2.6 Introduction to other HANS Facilities

HANS provides a range of facilities to simplify the tasks of entering data and controlling the output of data at your terminal. These facilities are described systematically in sections 3 and 4. The present section provides a simple introduction to the most commonly used of these facilities. HANS facilities can be obtained in one of two ways:

- (a) by entering a single control character as part of an input message. (These are known as *controls*.)
- (b) by entering the HANS *enquiry* and, when the HANS> prompt appears, entering a HANS *command*.

Controls can be used during input of any type of message. They take immediate effect and, normally, you continue to input the message after execution of the control. If, however, the HANS *enquiry* is entered during input of a message, the characters of the current line so far accumulated are lost and HANS prompts for its own input message. When the HANS input message (the command) has been dealt with, you can (again) begin to enter the current line of the service message. Notice, in particular, that HANS controls may be used during the input of a HANS command.

There are controls for

- sending an attention interrupt (CTRL+'A')
- sending a break interrupt (BREAK key)
- deleting the preceding input character (DELETE or RUBOUT or ERASE)
- deleting a whole line of input characters (CTRL+'D')
- repeating a line of input characters (CTRL+'R')
- finishing the output of characters (CTRL+'F')
- suspending output (CTRL+'S') and restarting it (CTRL+'Q')
- turning echo on/off for current line (CTRL+'X',CTRL+'Y')
- tabbing (CTRL+'I')
- extending the character set (CTRL+'N' SO – Shift Out, and CTRL+'O' SI – Shift In)

These and others are described in detail in section 3. A full reference list of the controls is given in section 7.1.

There are commands for:

- connecting to a host service (CONNECT),
- disconnecting from a host service (DISCONNECT),
- setting terminal speeds (SPEED),
- setting terminal characteristics (TERMINAL)
- displaying terminal and user characteristics (SHOW),
- providing information on the use of HANS (HELP),

An introduction to these commands is given in section 4. Full reference details appear in section 7.2.

3. HANS Controls

The following control characters can be used *at any time* during which your terminal is connected to HANS. In particular, appropriate control characters can be used to modify data while it is being entered at the terminal for any service, or to control output from any service.

3.1 Generating Interrupts

CTRL+'A' This produces an 'attention' interrupt. The characters (if any) so far stored for the current message are lost.

If you are in direct communication with a host service at the time that you enter attention, HANS will transmit an appropriate attention interrupt to that service; the actual effect this produces is determined by the service.

If you are executing a HANS command and you also have an active service session at the time you enter attention, execution of the HANS command will be abandoned. A message of the form:

HANS: COMMAND TERMINATED BY ATTENTION

is produced. The HANS command has been stopped, but the service is unaffected. Your terminal is back in direct communication with the service; you must enter enquiry to get a prompt for a further HANS command.

If you are executing a HANS command and you do not have an active host service session at the time you enter attention, execution of the command is stopped, and you will be prompted to enter a further HANS command in the usual way:

HANS>

BREAK Pressing the BREAK key or breaking the transmission line to the terminal causes the characters (if any) so far stored for the current message to be lost.

If you are connected to a host service at the time you enter a break, HANS will transmit a break interrupt signal to that service, will disconnect your terminal from the service, and will produce a message of the form:

HANS: CONNECTION BREAKING (USER PRESSED BREAK)

Note that disconnection from the service occurs even if you are executing a HANS command at the time of the break.

If you are not connected to a host service, your terminal will be disconnected from HANS. Your HANS session will be cleared down at this time and a message of the form

HANS: SESSION BREAKING (USER PRESSED BREAK)

will be produced. Hence, *any* time you press BREAK twice in succession you will be disconnected from the host service (if any connection exists) and from HANS.

CTRL+'E' This control produces the ASCII ENQ control character. It can be used to 'interrupt' the dialogue with a host service in order to carry out HANS functions (see 2.1). This use of the ENQ control is consistent with ASCII standards in the sense that it is used to get attention from HANS. (Previous releases of HANS allowed the Escape (ESC) key to be used as an alternative to CTRL+'E'. This was done on the grounds that the HANS command that followed such an ESC control, did indeed define control actions for the terminal. It now appears to be more convenient for users in the longer term to reserve ESC control for direct use in *escape sequences*.)

3.2 Correcting Input

DELETE(DEL) or RUBOUT or ERASE Each of these characters causes the preceding input character to be erased from the message. Repeated use of these characters causes characters to be erased from the end of the current line in reverse order of their entry.

The exact effect seen at the terminal depends on the Delete—Action option last selected in a TERMINAL command (see 4.). If the *show* option is selected (and this is the default option), then a '^' (backslash) character followed by a copy of the character to be erased is output; if several erase controls are entered in succession, a copy of each character erased is output to the terminal and, after the last erased

character has been output, a further '\ ' character is output before the echo of the next input character; the erased characters therefore appear between backslash characters. If the *hide* option is selected, then each erase control causes the erased character to be overwritten (hidden) by a blank character and the input position is backspaced one place. Hide works best on a VDU (CRT) terminal while Show works on either a hardcopy terminal or on a VDU.

- CTRL+'D' The characters (if any) so far stored for the current line are deleted. HANS will output '↑ D' then move the input position to the start of the next line so that the input can be re-entered.
- CTRL+'R' This control causes the characters so far stored for the current line to be displayed (repeated) at the terminal. This can be used to confirm the effect of earlier erasures. Note that if echo has been turned off or if the current line characters have not yet been echoed, CTRL+'R' will have no effect.

3.3 Controlling Output

The following controls can be used to cause a temporary pause in the output of messages at the terminal or to omit part of a message.

- CTRL+'S' Suspend output. The output halts at the end of the current line set. '...' is displayed on the next line to show that output is *suspended*. Output can be resumed by entering CTRL+'Q'.

CTRL+'S' is the ASCII DC3 device control character, also known as XOFF. If the terminal has ASCII automatic device control, this can be used to provide a 'handshake' control for HANS output. Note, however, that, as currently implemented, the HANS response to DC3 is not immediate; output continues to the end of the current line set and is followed by the output of 'CR LF ...'. If an immediate halt to output is required, this may be produced by the CTRL+'F' control described below, but at the risk of losing some of the output data. It should be possible in most cases to match terminal buffer limitations with an appropriate choice of *page-length* (see below). The TERMINAL command can be used to change the control code.

- CTRL+'Q' Quit suspension of output.
This control is the ASCII DC1 device control character, also known as XON. If the terminal has ASCII automatic device control, this character can be used as a 'handshake' control to resume HANS output. The TERMINAL command can be used to change the control code.

HANS will automatically suspend output to a terminal at the end of each *output page*. The number of lines on an output page is defined by

the Page–Length operand of the TERMINAL command (see 4.4). The default setting is 20. If page-length is defined to be *zero*, HANS will only suspend output when CTRL+'S' is entered.

The concept of *output page* applies only when output is being sent to the terminal without intervening input. Hence, with default settings, if a service sends a long listing to the terminal, HANS will suspend output after each 20 lines. Enter CTRL+'Q' to continue with the next 20 lines of output.

CTRL+'F' Finish current output immediately; any remaining characters for the current line set (see 2.5) are lost. Display will resume without pause at the start of the next line set. This control may not be effective on certain terminal lines used for higher speed output because the output of a line set of text to these terminals is done as a single autonomous action.

CTRL+'F' is the ASCII ACK Acknowledge control. HANS terminals need not acknowledge output sent to them but the (premature) arrival of an acknowledgment character causes the current output to be terminated. ACK followed immediately by DC3 or XOFF, might be used to suspend output immediately. Note that data may be lost if this technique is followed.

3.4 Controlling Input

HANS provides the means to control input from automatic terminals or from terminals with auxiliary reading devices (e.g. paper tape, floppy disk or cassette). The TERMINAL command may be used to turn on auxiliary reading. Some host services provide support for auxiliary reading (e.g. APPENDPT in HUW); in these cases the service will automatically turn on auxiliary reading at the appropriate time.

In auxiliary reading mode, HANS sends a device control character to the terminal at the start of each input line or record and another at the end of each input line or record. By default, the ASCII DC1 or XON character is sent at the start of input and the ASCII DC3 or XOFF character is sent at the end of input. The user can select which pair of the four ASCII device control characters DC1, DC2, DC3, DC4 is to be used for this purpose.

3.5 Controlling Echo

CTRL+'X' Turn echo off.

CTRL+'Y' Turn echo on.

These two controls take effect immediately and the effect lasts until the end of the current line. Note that the host service may also cause

echoing to be turned off (e.g. while prompting for a password). The ECHO option of the TERMINAL command(see section 4.4) is available to control echoing for more than one message.

3.6 Format Control

Tabbing HANS does not provide a completely general means of setting tab positions (i.e. positions at which typing is to continue). Instead, HANS allows you to divide the input line into *fields*, each field being a set of contiguous character positions and each field having the same number of character positions. The HANS command TERMINAL allows the number of characters in each field (the *field-width*) to be changed. The default field-width is six(6).Hence with the default settings, the input line is divided into fields of six characters (six columns) each.

CTRL+'I' Tab (skip) to the first position in the next field. Space characters (blanks) are inserted between the current position on the input line and the new position. The spaces are part of the message being constructed, but the CTRL+'I' character is not stored as part of the message.

With default settings, if CTRL+'I' is the first character entered on a line then six spaces will be stored in the input line and the next character entered will go into position (column) 7.

CTRL+'I' is the ASCII HT Horizontal Tab character. It is generated by a separate key (marked TAB) on some keyboards.

If the service to which you are connected offers a tabbing facility based on a tab character, the service tab character can be sent to the service as a data character within the input message; you may need to use data transparency (see 3.8 below) if the service tab character is also a HANS control. In this case, the visible effect at the terminal is limited to echoing the tab character, if echoing is on.

Backspace The ASCII BS Backspace format effector (CTRL+'H'), is *not* treated by HANS as a control character. Backspace may be used as a data character in any HANS message. In particular, backspace may be used to construct overstruck symbols of the form *character BS character* (e.g. for APL). On some terminals it may not be possible to view the overstruck character correctly because the terminal only displays the second character in the overstruck combination. Nevertheless HANS will store the combination and will send it in full to the service. Note that the backspace effect seen at a terminal with the *hide* option in force when a delete control is entered, does *not* result in a backspace character being stored in the message; only the

corrected character is stored.

Line Feed The ASCII LF Line Feed character (CTRL+'J') causes the current line of input from the terminal to be terminated. If LF has been selected as *end-of-message* character, the current message is also terminated; the LF is converted to a standard *end of message* delimiter. Otherwise the only effect is that the cursor or carriage is returned to the beginning of the next line ready to receive the next line of the current message. Note that the LF character is *not* stored as part of the line or message.

Carriage Return The ASCII CR Carriage Return character (CTRL+'M') causes the current line of input from the terminal to be terminated. If CR has been selected as *end-of-message* character (this is the standard default), the current message is also terminated; the CR is converted to a standard *end of message* delimiter. Otherwise the only effect is that the cursor or carriage is returned to the beginning of the next line ready to receive the next line of the current message. Note that the CR character is *not* stored as part of the line or message.

Forms Control The ASCII format effectors VT (CTRL+'K') vertical tab, and FF (CTRL+'L') form feed, are *not* treated by HANS as control characters. They are echoed to the terminal and stored in messages as if they were data characters.

3.7 Extending the Character Set

The default character set used by every terminal on HANS is the ASCII 7-bit set variant of the International Alphabet No. 5 (IA5) or ISO 646 (see 7.3). The method for extending this set proposed in International Standard ISO 2022 is supported by HANS in the following way:

Alternative sets of graphic (i.e. printable) characters may be defined to replace the standard set of graphic characters, occupying columns 2 to 7 of the standard table and having values in the range 32 to 127. Only one alternative set can be in use at any one time; this set will be referred to as the *alternate set*. In ISO 2022 the two sets of graphic characters are referred to as G0 and G1 and it is recommended that the standard set of graphics be assigned to the G0 set with the alternate set assigned to G1. Unfortunately not all terminal manufacturers follow this recommendation. Some assign the alternate graphics to G0 with the standard graphics as G1. This has implications for the interpretation of the HANS controls (see below).

Each alternate set will be given a name for use on HANS. By using the `TERMINAL` command the user can specify by name which alternate set will be used. (This is the equivalent of an escape sequence; it may be possible to introduce an alternate set by direct use of the appropriate escape sequence in a later release of HANS.) The user will also specify whether the standard set is to be assigned as G0 or G1.

When the G1 set is to be brought into use, the user will enter a *shift out* control, SO (see below). HANS will from then on interpret the characters coming from the terminal as belonging to the G1 set and will translate them, as necessary, for use by host services. When the user next enters a *shift in* control, SI (see below), HANS will revert to the G0 set.

When an alternate set is in use, the HANS controls remain in effect. In particular, it is possible to enter HANS commands. Before sending any message to the terminal (including the prompt for a command) HANS will send the appropriate control (SI or SO) to switch back to the standard set. It is assumed that this is sufficient to restore the use of the standard character set for the duration of the message or command. HANS will also send the appropriate control (SO or SI) at the end of the message or command to restore the alternate character set. Thus, provided the terminal is able to use the SO and SI controls to switch character sets, HANS messages and interactions will appear in the standard character set and the alternate character set will be re-established at the end of each HANS transaction.

CTRL+'N' is the ASCII SO Shift Out control. It causes the current line of input to be terminated. The control character is echoed to the terminal (if echoing is on) and HANS switches to the G1 character set defined in a preceding `TERMINAL` command or by default. Further characters may then be entered to complete the current message.

It is expected that the echo of the control to the terminal is sufficient to switch the terminal to the G1 character set; if not, it is the user's responsibility to take what further action is needed to establish the G1 character set on the terminal.

CTRL+'O' is the ASCII SI Shift In control. It causes the current line of input to be terminated. The control character is echoed to the terminal (if echoing is on) and HANS switches to the G0 character set. Further

characters may then be entered to complete the current message. It is expected that the echo of the control to the terminal is sufficient to switch the terminal to the G0 character set; if not, it is the user's responsibility to take what further action is needed to establish the G0 character set on the terminal.

3.8 Entering Data Transparently

It is sometimes necessary to store what would normally be treated as a control character in the text of a message. For example, if we want to store control sequences for a device in a computer file, it may be necessary to store a string of characters of the form *escape character character*. The *preserve* control allows *any* character to be treated as data. This is referred to as *data transparency*.

Data transparency in HANS at this stage of its development is restricted to *single character transparency*. To provide for the transparent transfer of a string of characters, it will probably be necessary to use the *preserve* control in conjunction with other controls. When this is to be done, the user will be asked to choose between single character transparency and character string transparency by an appropriate parameter of the TERMINAL command.

CTRL+'P' Preserves the next character entered. The CTRL+'P' is not stored as part of the message and will not be sent on to the service. Instead, the next character entered will be treated as a data character and stored in the message text no matter what character it is. This can be used to store HANS control characters in message text.

Note that as the CTRL+'P' character is not stored in the message text, it is necessary to enter *two* CTRL+'P' characters in succession to store a CTRL+'P' character in the text.

CTRL+'P' is the ASCII DLE Data Link Escape communication control. Its standard use, in conjunction with STX and ETX controls, is to provide data string transparency; i.e. the ability to sent strings of arbitrary character codes without the risk that they will be misinterpreted as control characters. Note that the use of DLE for single character transparency is not strictly speaking standard, but it is so convenient for limited use from a terminal keyboard that it has been decided to offer this as a HANS feature.

4. HANS Commands

4.1 The HANS Command Language

A formal description of the syntax of HANS commands is given in section 7.2. This section provides a less formal but, we hope, helpful introduction to the command language.

Form Commands take the form

verb operand(s)

Command verbs may be abbreviated so long as sufficient characters are given to distinguish the particular verb from all others. In HANS, command verbs have been chosen so that the first three characters, at most, are sufficient to determine the command to be executed. Verbs and operands must be separated from one another by

- at least one space,
- or* one comma,
- or* a combination of multiple spaces with one comma (in which case the multiplicity of spaces have no additional effect).

Verbs, operand keywords and values may be entered in upper or lower case characters, or in a mixture of upper and lower case. In the examples shown in this manual, computer output text is shown in upper case with user input in lower case so that the two can be more easily distinguished.

Keywords All operands have *keyword* names. Operand values can be defined as *keyword assignments* of the form:

- ... keyword ...
- or* ... keyword = value ...
- or* ... keyword (space) value ...

Keyword assignments must, of course, be separated from each other by commas and/or spaces.

Ordering Operands, however, are defined in a fixed order for each command and you can enter values for operands without stating the keyword provided that the values occur in the same order as the corresponding operands were defined. We call these *anonymous values*. A mixture of anonymous values and keyword assignments is allowed within a command. Keyword assignments can occur in any order. Since an anonymous value appearing after a

keyword assignment will be assumed to belong to the operand immediately following that keyword in the operand sequence, the least confusing method of specifying operands is to place all anonymous values before any keyword assignments.

Correction To provide for the possibility of correcting input without retyping the whole command, operand values may be supplied more than once within a command. In each case the effective value will be the value last read in scanning the command from left to right.

Phrases Keywords or values may take the form of *hyphenated phrases*. These are essentially a set of keywords joined by hyphens; e.g. END-OF-MESSAGE might be used as the keyword for the end of message character. In these cases the characters '.' (full stop) or ' ' (underline) may be used in place of hyphens if more convenient.

Abbreviation The HANS command language is designed to allow consistent abbreviation of *words* (keywords or keyword values) or *phrases* (hyphenated phrases). Words can be abbreviated to any degree so long as sufficient characters are provided to distinguish the word from any other *within the same context*. In the case of phrases, each individual word within the phrase can be separately abbreviated so long as no part of the resulting abbreviated phrase is ambiguous and the whole is unique within its context. At least one character from each hyphenated word is required (usually only one character is required); e.g. E-O-M or E.O.M or E O M are valid abbreviations for END-OF-MESSAGE, but E-M or E.M are not.

Help Entering a '?' in place of a command verb will be interpreted as a HELP command (see 4.5). Entering '?' in place of an operand will cause a standard short prompt of the form:

HANS: *operand-keyword* >

to be issued. Reply by specifying the value of the operand followed by a further '?' or by the values of further operands. If no further operands are required, HANS will issue a prompt of the form:

HANS: GO?>

to which you reply 'YES' if you want the command to be executed, 'NO' if you do not. If you reply with a '?' to a short prompt, a longer, more explanatory, prompt message will be issued if one is available; if not, the short prompt will be repeated. Note that the scan of the command entered stops at the '?' character; any characters typed after the '?' will be ignored.

Strings Certain operand values consist of a *string* of characters. To show that a sequence of arbitrary characters is to be treated as a single entity (a single string) the characters must be enclosed between *single quote* characters (' ... '). If the string itself contains a quote character, enter *two single quote* characters at that position in the string; one single quote character will be

stored in the string.

Defaults In the case where there is a choice of possible values, the values are listed in a column; if there is a *default*, or standard value that will be assumed if no other value is provided, it is underlined.

Errors If an error is detected in the form of a command, HANS will repeat the text of the command line up to the point at which the error was detected (shown by a '*' after the last correct character read). This will be followed, on a separate line, by the message:

HANS:ERROR

No recovery is attempted. You must enter a correct version of the command line. Sending '?' to HANS at this point will produce extra diagnostic messages if these are available for the error in question.

Examples

The SPEED command has five operands. Below is a sample of a formal definition of this command. It is not important at this stage to understand all the operands, simply that the command allows you to change the transmission speed used by your terminal. Normally you would set both the input and output speeds to the same value but, if the hardware allows, the SPEED command will let you set different input and output speeds.

SPEED	Both = input-and-output-speed
	Input = <i>input-speed</i>
	Output = <i>output-speed</i>
	<u>Fix</u> = $\left(\begin{array}{c} \text{Yes} \\ \text{No} \end{array} \right) \left(\begin{array}{c} \text{Baud} \\ \text{Characters-per-second} \end{array} \right)$

If input and output speeds are both to be set to 600 baud, the command could be written:

```
HANS>speed 600 baud
```

where baud is strictly redundant, or

```
HANS>speed both 600
```

or

```
HANS>spe b=600
```

or

```
HANS>spe o=600 i=600
```

or (even)

```
HANS>spe i=600, 600
```

The last of these methods is not recommended, even if it does work.

Since 600 baud corresponds to 60 characters per second, the same effect can be got by entering:

```
HANS>spe 60 c.p.s
```

or

```
HANS>spe i=60 o=60 c.p.s
```

4.2 Connecting and Disconnecting

The primary purpose of the HANS network is to connect your terminal to services. Connection requires formal agreement between the sub-system supporting your terminal and the *service handler*, as it is known, that supports the service of your choice. The process of reaching agreement involves a negotiation in which terminal characteristics and rules for exchange of messages have to be chosen. This process is set off by the CONNECT command. You will hardly be aware of the details of this process unless there is a conflict which requires your attention. The details of messages that can appear, and what you can do about them, are given under the CONNECT command in section 7.2. For present purposes the description given in sections 2.1, 2.2 and 2.3 should suffice for normal use.

4.3 Speed Setting

The transmission speed used for your terminal can be changed using the SPEED command. If the terminal hardware permits, you can set different speeds for input and output (see section 7.2 for details). Normally, however, the same speed is used for both input and output and this is the only case described here.

Enter

```
HANS> speed nnn
```

where *nnn* is the new speed in *baud* (baud is essentially bits/per/second and is the unit most commonly used to label the speed switches on terminals). HANS changes the *input* speed to the new value then issues a prompt (using the existing output speed) of the form:

```
HANS: SPEEDS (BAUD) nn IN nn OUT , OK? REPLY 'YES' OR 'NO' >
```

where *nn* is the new speed. When the prompt has been sent, HANS sets the specified *output* speed. At this stage, therefore, so far as HANS is concerned, the speed change has been made. You should switch your terminal to the new speed(s) before replying to the prompt. If the reply you enter is echoed correctly, you have a direct check that the speeds are correctly set up. (If not, you must experiment until you do get a correct echo. You cannot enter end-of-line until you have seen a correct echo because the end-of-line character will not be recognised.) Entering Attention (or replying 'No') at this stage, *provided this can be done at the new speed*, will cause HANS to output (at the *new* speed) a message of the form:

```
HANS: SPEED (BAUD) IS STILL nn IN , mm OUT
```

If you enter BREAK (which can be detected at *any* speed) HANS will also reset to the original speeds but it will disconnect your terminal from the host service, if you are currently connected to one. This will produce (at the *original* speed) messages of the form:

```
HANS: CONNECTION BREAKING (USER PRESSED BREAK)  
HANS: SPEED (BAUD) IS STILL nn IN , mm OUT
```

HANS may impose restrictions on the range of speeds available at your terminal. If the speeds you specify lie outside the acceptable range, HANS will not change speed and will output a message of the form:

HANS: SPEED SPECIFIED IS OUT OF RANGE
HANS: *nn* IN *nn* OUT MAXIMUM.

Only certain standard speeds are available. These are 110, 150, 300, 600, 1200, 2400, 4800, and 9600 baud. If you do not select one of these speeds, HANS will not change speed but will output a message of the form:

HANS: SPEED SPECIFIED IS NOT PERMITTED.
HANS: PERMITTED SPEEDS (BAUD) ARE

Example:

HANS>spe 300

or

HANS>speed 300 baud

or

HANS>speed both 300 baud

sets both input and output speed to 300 baud.

4.4 Terminal Characteristics

The `TERMINAL` command, can be used to modify characteristics of the terminal either temporarily or on a more permanent basis for terminals attached permanently to the network. The full set of characteristics that you can change at present is described in detail in the reference description of the command in section 7.2. In this section, the features to be implemented first will be described.

To turn echoing off for more than one input line (e.g. for a half-duplex terminal), enter:

HANS>terminal echo off

To set the width of a tab field (see section 3.5), enter:

HANS>terminal tab-width= *nn*

where *nn* is the new tab field width.

If you enter

HANS>terminal delete-action=hide

or

```
HANS>ter d.a hide
```

for short, subsequent delete controls (see section 3.2) will cause the character(s) deleted to be overwritten with space characters. This causes a 'rubout' effect on a VDU terminal. Alternatively, if you enter:

```
HANS>term del.act show
```

each deleted character will be echoed to the terminal, the whole string of deleted characters being enclosed between backslashes (^ ... \).

The number of lines that are to be displayed at the terminal without intervening input is defined by the *page-length* operand of TERMINAL. If you enter:

```
HANS>terminal page-length=10
```

or

```
HANS>ter p.l 10
```

for example, and you are listing a file (or receiving a long message) at your terminal, HANS will suspend output after each set of 10 lines has been displayed, will display ' . . . ' on the next line and will not continue the output until the *quit suspension* control (CTRL+'Q' or XON) has been entered.

To get a report of the current characteristics defined for the terminal, enter:

```
HANS>show
```

This will produce a formatted message showing all the terminal characteristics. To get a report about a particular characteristic, enter:

```
HANS>show name-of-characteristic
```

For example,

```
HANS>show page-length
```

would give the current page length.

4.5 Messages

The ACCEPT command can be used to control the level of broadcast messages that are to be accepted at your terminal. Broadcast messages can come from any service, or from the network operators. We will refer to broadcast messages here simply as *messages*.

Each message on HANS is given a *level* marking by its sender. The ACCEPT command allows you to set the level of your terminal so that only messages that have a higher level will be displayed when they arrive. The display of a message will fill one or more lines of output at the terminal. This will obviously interfere with layout of other messages (e.g. those from the service you are currently using and the echo display of your input messages), but the display of messages will not have any other effect on the current dialogue. Note that the intermixing of messages is done line by line; at the least, a message will not be displayed until the current line is completed.

The levels that can be set are *general*, *information*, *warning*, and *alarm*. If a level of *general* is set (and this is the default), all messages directed to the terminal will be displayed. If a level of *information* is set, only messages of a level equal to or higher than this will be displayed, and so on. The highest level that can be set is *alarm*, and at this level messages that are considered imperative for your continued satisfactory use of the system, will be displayed. The *imperative* level will only be used for urgent system messages (e.g. those warning of the imminent close-down of the network as a whole).

To set the message acceptance level to *general*, enter

```
HANS>accept level=general
```

or

```
HANS>acc gen.
```

Other levels can be set in a similar way. In fact, whenever the ACCEPT command is used, whether the level is changed or not, the number of messages you have missed since the last time you issued an ACCEPT command will be printed. These are messages presented to the terminal during the current HANS session which could not be displayed on the terminal at the time of their presentation. The text of the messages themselves is not stored by the terminal sub-system; instead, to see the text, you must DISCONNECT from any existing service, CONNECT to the MESSAGE service and use the commands of that service to select the messages.

If you wish to send a message to the HANS operator, enter

```
HANS>send ' text '
```

The level given to such messages is *general*.

4.6 Help

The HELP command provides tutorial messages about the HANS facilities. Enter

```
HANS>help help
```

for guidance about this command.

5. Host Services

5.1 APL

APL is an interactive programming language. The acronym *APL* actually stands for *A Programming Language*. It is based on a mathematical notation invented by K.E. Iverson in 1957 to enable the processes of data manipulation performed by computer systems to be described succinctly and accurately. It is now used as a general purpose programming language.

At Harwell the APL service is currently based on IBM VS/APL and uses an interactive system called VSPC (Virtual Store Personal Computing) as a base for communication with the terminal.

Each registered user of APL has a collection (known as a *library*) of *workspaces*. A *workspace* is a group of *functions* and data collected together for some particular purpose. For example, one workspace may contain a set of related functions for plotting graphs, another for doing stress analysis calculations. The user also has access to a standard library of workspaces and can make his own copies of the standard workspaces. In most cases the user can use the functions in a workspace without having to write APL programs. It is not absolutely necessary to be able to program in APL in order to benefit from the services of one of our standard APL workspaces. It is also not necessary to have an APL keyboard or the APL character set on your terminal to use some of these services; you must however enter commands etc. in upper case letters (use the CAPS key if your terminal has one). If you do need to use the APL character set, see section 3.7 and the TERMINAL command for details on how to do this on HANS.

There are standard workspaces at Harwell for:

- ADRS A Department Reporting System (Allows user to store, sort, select, summarise and display (in report form) tabular data)
- MINIPERT (Provides PERT based project activity management functions such as calculating schedules, critical paths etc.)
- Zeros and Integrals (Roots of equations and integration)
- Graphs and Histograms
- Text Editing

To register for the APL service contact Computer Reception, Building 8.9 (Ext 2052) for application forms. Each registered user of APL has a *user-number* and a *password*. To logon to APL via HANS, *connect* through the VSPC service:

```
HANS>vspc 'id= user-number '
```

Note that VSPC will always *prompt* for the password; it is not possible to enter the password as part of the *logon text*. VSPC, and therefore APL, is supported on HANS using full duplex message exchange (see 2.5). HANS will not inhibit echo on the password prompt (see 2.5) so you must use CTRL+'X' (see 3.5) to do so if necessary.

HANS supports line mode terminals on APL as if they were IBM 3767 SDLC terminals. Any references in IBM literature (e.g. in the Terminal Users Guide referenced below) to operation of

SDLC 3767s with APL will therefore generally apply to HANS line terminals. Remember, however, that HANS terminal support is, in general, independent of the service to which you are connected. For instance, the HANS attention control (CTRL+'A') is used to send an *appropriate* attention signal to the service. In the case of APL, CTRL+'A' will have the same effect as if you pressed PA1 on an IBM terminal. The other controls (character and line deletion, input output control etc) apply in their normal HANS form.

For further information on APL contact Computer Information Room, Building 8.9 (Ext 3034). The following manuals provide introductory information:

- Harwell APL Users Guide (From Information Room)
- APL Primer (IBM manual GH20-0689)
- APL Language (IBM manual GC26-3827)
- VS/APL for VSPC: Terminal Users Guide (IBM manual SH20-9066) (*Line-mode* terminals on HANS are mapped into IBM 3767 terminals on the APL service.)

Individual manuals for the major standard workspaces (ADRS, MINIPERT etc.) are also available.

5.2 HUW

HUW (Harwell Users Workshop) is a multi-access terminal system for the interactive editing of source text and submission of jobs. It was developed at Harwell, starting in 1967, to provide conversational remote job entry from Teletype terminals.

HUW provides a set of basic commands and a command macro facility geared to text editing and job submission. The system is described in the HUW Users Manual, available from Computer Reception (Ext 2052), Building 8.9. There are commands for:

- Creating, saving, copying, deleting a file (of text lines)
- Editing a line or a set of lines
- Submitting a job
- Finding job status, cancelling a job
- Creating and using a macro command; using a system macro command

Each HUW user has a three-letter *user-identifier* and a *password*. Some users have more than one computer *account number* to which HUW use is to be charged. To logon to HUW via HANS enter:

```
HANS>huw ' user-identifier password '
```

If you have more than one account number, the account number to be charged for the current session is stated after the password.

HUW is supported on HANS using half duplex message exchange.

To register for use of HUW apply to Computer Reception, Building 8.9 (Ext 2052).

5.3 TSO

TSO (Time Sharing Option) is a fully interactive time-sharing service. TSO is a standard feature of the IBM Operating System used on the Central Computer at Harwell – MVS. By typing commands into a terminal, each user can create programs, test programs by running them interactively, execute programs either interactively (in *foreground*) or offline (in *background*) and recover results at the terminal in both cases.

Because TSO is a very powerful interactive service it has many commands – too many to list here. It is a general purpose interactive system; tasks can be programmed in a number of programming languages including FORTRAN, PL/1, COBOL and IBM Assembler. For more information about the TSO service at Harwell see:

- *TSO at Harwell* (AERE – R9542 and supplements)
- OS/VS2 TSO Command Reference Manual (IBM manual GC28–0646)
- OS/VS2 TSO Terminal User's Guide (IBM manual GC28–0645) (*Line-mode* terminals on HANS are mapped into IBM 3767 terminals on the TSO service.)

Copies of these manuals are available from Computer Reception, Building 8.9 (Ext 2052). You should also apply there for a registration form to become a TSO user. Each registered TSO user has a six-letter *user-identifier* (composed of a three-letter *division-identifier* and a three-letter personal identifier), a *password*, an *account-number* and a *logon-procedure-name* (*proc-name* for short). To logon to TSO via HANS enter:

```
HANS>tso 'logon user-identifier/password ac( account-number ) pr( proc-name )'
```

If you have only one account-number or logon procedure, you can omit the `ac` and `pr` parameters. If you wish to specify other logon options (see reference manuals), these can be enclosed within the quote marks. Any valid logon text that can be sent to TSO can be entered between the quote marks. You can specify up to 64 characters of logon text between the single quote marks; the whole command must be complete within one line.

TSO is supported on HANS using full duplex message exchange (see 2.5). If you wish to be prompted for your password, omit the password from the logon text but remember that since HANS will not inhibit echo on the password prompt (see 2.5), you must use CTRL+'X' (see 3.5) to do so if necessary. It's probably easier – it's certainly quicker – to use CTRL+'X' when entering the password part of the logon text if it is essential to avoid displaying the password.

HANS supports line mode terminals on TSO as if they were IBM 3767 SDLC terminals. Any references in IBM literature to operation of SDLC 3767s with TSO will therefore generally apply to HANS line terminals. You should remember, however, that HANS terminal support is independent of the service to which you are connected. For instance, the HANS attention control (CTRL+'A') is used to send an *appropriate* attention signal to the service. In the case of TSO, CTRL+'A' will have the same effect as if you pressed PA1 on an IBM terminal. The other controls (character and line deletion, input output control etc.) apply in their normal HANS form.

6 Information Services

6.1 Directory of Services

The DIRECTORY service provides information about the host services available on HANS. Unlike other services it is not necessary to be a registered user of DIRECTORY to use it. Any HANS user can access the DIRECTORY service by entering a CONNECT command of the form:

```
HANS>directory 'request'
```

where *request* is a specific request for information.

Possible requests include:

Services A list of all host services that are generally available on HANS.

Current A list of the services which are actually available at present.

Schedules A list of the operating times and schedules for all services available on HANS. schedules *service-name* will produce a schedule for the service named.

Example

To find the current operating schedule for TSO:

```
HANS>dir 'sch tso'
DIR: TSO is available 8.00 am to 10.00 pm, Monday to Friday
HANS: CONNECTION BREAKING (BREAK ISSUED BY REMOTE)
```

Note that the first three letters of the service name are used here as abbreviation.

6.2 MESSAGE

The MESSAGE service allows users to create, send and receive *memos* – i.e. messages. MESSAGE also allows appropriately qualified users to list recent broadcast messages for different services.

Before you can use the MESSAGE service, you must register a standard *user-identifier* consisting of a three-letter divisional identifier followed by a three letter individual identifier, and assign an initial *password*. You must also assign one or more *account number(s)* to which usage of the service is to be charged. To register for MESSAGE, contact Computer Reception, Building 8.9 (Ext 2052).

To use MESSAGE, you must *connect* to it in the usual way (a three letter abbreviation mes is used on HANS for the name of this service):

Provisional Information

HANS>mes '*user-identifier password account-number*'

Account-number can be omitted if you only have one. *Password* can also be omitted, but, in that case, MESSAGE will prompt for the password before completing the logon.

If the connection has been accepted by MESSAGE, a prompt of the form:

MES>

will appear. You can now enter MESSAGE commands, including:

- HELP with MESSAGE commands
- MEMO to issue a message
- LIST to list messages
- EDIT to edit a message
- DELETE to delete a message or messages
- PASSWORD to change the user password
- HARDCOPY to change the hardcopy option
- LOGOFF to logoff from MESSAGE

Memos and Messages

The MESSAGE service handles two types of message: *memos* and *broadcasts*. A normal user can only list *broadcast* messages – and you have to be logged on by a route that meets our security requirement to list certain broadcasts. You can create *memos*, read memos sent to you by others, send memos to other users individually or in groups. Each message in the system is given an unique reference number when it is created. This is the shortest reference for the message, but you can usually handle your correspondence without reference to these numbers. The memo *belongs* (for security purposes) to the user who created it but a copy can be made by any user entitled to receive it. When you list a memo, you will be asked whether you want to save a copy (as a text file), or have a hardcopy produced on a printer. The text file copy *belongs* to you; you can issue it as another memo (with its own reference number) if you want to.

The creation time and date will be recorded by MESSAGE on every memo. You can specify an expiry time and date for the memo. Each memo has a defined *security level*. Before a memo with a given security level can be read, the physical path over which it is to be read is checked to see that it meets the level set for the memo (i.e. there will be messages that can only be seen by users at appropriate terminals).

Delivery of Messages: The Hardcopy Option

When you send a memo to another user it is normally expected that he will read it by means of the MESSAGE service; i.e. he will connect to MESSAGE and read the memo among others that are waiting for him. But MESSAGE allows you to specify that all memos directed to you are to be printed in hardcopy form with your normal postal address and delivered to you by conventional means. Hence if you are to be away from your office for some time, you can arrange for memos to be delivered on paper in your absence. On

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your return you can change back to electronic delivery. This feature will also be used to clear out *old* memos that have been waiting to be delivered for more than a pre-defined time. It will be assumed that delivery on paper is always acceptable as a fallback. Each message will contain an indication of any special form (e.g. use of preprinted stationery) needed for hardcopy delivery.

You can set a time limit for delivery of any memo. If the recipient does not read it by the time you specify, the memo can be destroyed or output on paper.

You can also request *recorded delivery*; i.e. a message is to be generated and sent back to you when the memo is read by its intended recipient.

TELEX

It is hoped to provide a means to send and receive TELEX messages. Messages to be sent over the TELEX service should be sent to the special destination TELEX. The Telex operator will acquire them and pass them on. Incoming messages will be fed into the MESSAGE service if it is possible to tell from their text the *user-identifier* of the intended recipient. *Details of these arrangements have yet to be settled; this information must not be taken as a guarantee that the service will operate in this way or at all.*

Storage of Messages

Users have text files in which they can keep the text of messages and text fragments from which to construct messages. This storage space will be charged for depending on the total amount held. When you issue a message it is recorded in the *Message File*. The space occupied by a message in the message file will be charged to you until the (last) intended recipient of the message has referred to it. If you want to keep a copy of any message directed to you, you must save it as a text file.

MESSAGE Commands

In addition to the ACCEPT and SEND commands described elsewhere in this manual, the MESSAGE service provides the following commands for use when you are connected to it.

EDIT

File = *filename*

To edit a text file.

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DELETE

File = *filename*

To delete a text file.

HARDCOPY

Is = $\left(\begin{array}{c} \text{Off} \\ \text{On} \end{array} \right)$

With HARDCOPY On, all memos sent to the user will be printed in hardcopy form for delivery by conventional means.

HELP

Command =

$\left(\begin{array}{c} \text{HELP} \\ \text{EDIT} \\ \text{LIST} \\ \text{MEMO} \\ \text{PASSWORD} \\ \text{HARDCOPY} \end{array} \right)$

Provides information about MESSAGE commands.

LIST

Type =

$\left(\begin{array}{c} \text{All} \\ \text{Memo} \\ \text{Broadcast} \\ \text{Information} \\ \text{Warning} \\ \text{Alarm} \end{array} \right)$

Source =

$\left(\begin{array}{c} \text{service-name} \\ \text{user-identifier} \end{array} \right)$

Date = *Starting date (dd/mm/yy)*

Time = *Starting time (hh.mm)*

Reference = *Starting reference number*

REVERSE

BRIEF

List all memos that meet the selection criteria. If REVERSE is specified, list them in reverse order of time and date. If BRIEF is specified, list heading only for all memos (heading contains the reference number, source *user-identifier*, creation date and time, expiry date and time and an estimate of the length of the message).

LOGOFF *no operands*

Logoff from MESSAGE.

MEMO

File = *file-name*
To = $\left(\begin{array}{l} \text{ddd...} \\ \text{ddduuu} \\ \text{TELEX} \\ \text{PRINTER} \end{array} \right)$
Keep = *period* $\left(\frac{\text{HOURS}}{\text{DAYS}} \right)$
Recorded-Delivery = $\left(\begin{array}{l} \text{NO} \\ \text{YES} \end{array} \right)$
Security = *security level*
Form = *form-number*

Sends the contents of the named file as a memo with the given options to the user (*user-identifier* ddduuu) or all users with *user-identifier* prefix ddd (if ddd . . .). The form number is used where the memo is to be delivered in hardcopy to control the type of paper form mounted in the printer. *Note that special user-identifiers such as TELEX may be defined for special purposes.*

PASSWORD *no operands*

Prompts user for a new password to replace the present one.

7.1 HANS Controls

HANS controls are listed in two tables; the first gives the controls in groups by function, the second gives the controls in alphabetic order by the control letter.

HANS Controls Grouped by Function

Key Depression(s)	ASCII name	Function	
CTRL+'A'	SOH	Attention interrupt to service	<i>Interrupts</i>
BREAK		Break signal to service	
CTRL+'E'	ENQ	Call HANS	
DELeTe RUBOUT ERASE	DEL	Delete last character input	<i>Correct input</i>
CTRL+'D'	EOT	Delete input line	
CTRL+'R'	DC2	Repeat input line	
CTRL+'S'	DC3	Suspend output	<i>Control output</i>
CTRL+'Q'	DC1	Resume output	
CTRL+'F'	ACK	Stop output	
CTRL+'X'	CAN	Turn echo off	<i>Echo control</i>
CTRL+'Y'	EM	Turn echo on	

HANS Controls Grouped by Function – continued

Key Depression(s)	ASCII name	Function
CTRL+'H'	BS	Store as backspace data character
CTRL+'I'	TAB	Space to next tab field
CTRL+'J'	LF	Normal end of line
CTRL+'K'	VT	Store as vertical tab character
CTRL+'L'	FF	Store as form feed character
CTRL+'M'	CR	Normal end of message
CTRL+'N'	SO	Shift out to G1 graphic set
CTRL+'O'	SI	Shift in to G0 graphic set
CTRL+'P'	DLE	Preserve next character as is

Format control

Character set

HANS Controls in Alphabetic Order

Key Depression(s)	ASCII name	Function
CTRL+'A'	SOH	Attention interrupt to service
CTRL+'D'	EOT	Delete input line
CTRL+'E'	ENQ	Call HANS
CTRL+'F'	ACK	Stop output
CTRL+'H'	BS	Store as backspace data character
CTRL+'I'	TAB	Space to next tab field
CTRL+'J'	LF	Normal end of line
CTRL+'K'	VT	Store as vertical tab character
CTRL+'L'	FF	Store as form feed character
CTRL+'M'	CR	Normal end of message

HANS Controls in Alphabetic Order – continued

Key Depression(s)	ASCII name	Function
CTRL+'N'	SO	Shift out to G1 graphic set
CTRL+'O'	SI	Shift in to G0 graphic set
CTRL+'P'	DLE	Preserve next character as is
CTRL+'Q'	DC1	Resume output
CTRL+'R'	DC2	Repeat input line
CTRL+'S'	DC3	Suspend output
CTRL+'X'	CAN	Turn echo off
CTRL+'Y'	EM	Turn echo on
BREAK		Break signal to service
DELeTe RUBOUT ERASE	DEL	Delete last character input

7.2 The HANS Command Language and Commands

This section consists of a formal definition of the HANS Command Language followed by reference sections for each command in alphabetic order.

Form Commands take the form

verb operand(s)

Command verbs may be abbreviated so long as sufficient characters are given to distinguish the particular verb from all others. In HANS, command verbs have been chosen so that the first three characters, at most, are sufficient to determine the command to be executed.

Verbs and operands must be separated from one another by

— at least one space,

or one comma,

or a combination of multiple spaces with one comma (in which case the multiplicity of spaces have no additional effect).

Verbs, operands and values may be entered in upper or lower case characters or in a mixture of upper and lower case.

Keywords All operands have *keyword* names. Some operands have values as well as keywords. Operand values can be defined as *keyword assignments* of the form:

— ... keyword ...

or ... keyword = value ...

or ... keyword (space) value ...

Keyword assignments must, of course, be separated from each other by commas and/or spaces.

Ordering Operands are defined in a fixed order for each command and values may be entered for operands without stating the keyword provided that the values occur in the same order as the corresponding operands were defined. These are defined to be *anonymous values*. A mixture of anonymous values and keyword assignments is allowed within a command. Keyword assignments can occur in any order. An anonymous value appearing after a keyword assignment will be assumed to belong to the operand next in operand sequence after the operand referenced by the keyword.

Correction To provide for the possibility of correcting input without retyping the whole command, operand values may be supplied more than once within a command. In each case the effective value will be the value last read in scanning the command from left to right.

Phrases Keywords may take the form of *hyphenated phrases* – a set of keywords joined by hyphens; e.g. END-OF-MESSAGE might be used as the keyword for the end of message character. In these cases the characters '.' (full stop) or ' ' (underline) may be used in place of hyphens if more convenient.

Abbreviation The HANS command language is designed to allow consistent abbreviation of *words* (keywords or keyword values) or *phrases* (hyphenated phrases). Words can be abbreviated to any degree so long as sufficient characters are provided to distinguish the word from any other *within the same context*. In the case of phrases, each individual word within the phrase can be separately abbreviated so long as no part of the resulting abbreviated phrase is ambiguous and the whole is unique within its context. At least one character from each hyphenated word is required (usually only one character is required). For example, E-O-M or E.O.M or E O M are valid abbreviations for END-OF-MESSAGE, but E-M or E.M are not.

Help Entering a '?' in place of a command verb will be interpreted as a HELP command (see 4.6). Entering '?' in place of an operand will cause a standard short prompt of the form:

HANS: *operand-keyword* >

to be issued. Reply by specifying the value of the operand followed by a further '?' or by the values of further operands. If no further operands are required, HANS will issue a prompt of the form:

HANS: GO?>

Reply 'yes' if the command is to be executed, 'no' if not.

A reply of '?' to a short prompt, will produce a longer, more explanatory, prompt message if such a message is available; if not, the short prompt will be repeated.

The scan of the command entered stops at the '?' character; any characters typed after the '?' will be ignored.

Strings Certain operand values take the form of a string of arbitrary characters. These may be presented as text between single-quote characters (i.e. ' ... '). If a single-quote character is to be part of the data, two single-quote characters must be entered at the appropriate position. A HANS string is defined to be a series of characters beginning with a single-quote character and ending with a single-quote character (the *string delimiting characters*) and such that any single-quote characters lying between these delimiting characters appear as pairs of successive quote characters. The string delimiters are not part of the data. The *value* of a HANS string is the series of characters starting with the character immediately following the first string delimiter (a single-quote), with a single-quote character substituted for each pair of contiguous single-quote characters, and ending with the character immediately before the ending delimiter character (an isolated single-quote). HANS strings can be used whenever operand values are defined to be *text* or *string*. HANS strings must be used if the text includes characters used as delimiters within HANS command syntax (e.g. blanks, commas, full stops etc.).

Defaults In the case where there are a limited number of alternate values, the values are listed in a column enclosed within round brackets. If there is a *default*, or standard value that will be assumed if no other value is provided, it is underlined.

Operand types Operands can be

mandatory – a value must be supplied with the command (a prompt will be issued if a value is not given),

self-setting – if no value is specified with the command the default value of the operand is assumed (all such operands have a default value),

name-only – if the operand is shown as a keyword without specified values, the appearance of the keyword in a command is sufficient to define the operand value (these operands represent options that are selected simply by making a reference to the keyword),

persistent – if no value is specified with the command the *previous* value specified for the operand is used (i.e. persists).

Mandatory operand keywords are printed in **bold**.

Self-setting operand keywords are underlined.

Persistent and name-only operand keywords are printed in normal type.

A persistent operand can be set to its default value (if it has one) by entering:

— ... keyword, ...

or ... keyword=, ...

or ...,... at the appropriate place in the operand sequence.

In other words, while self-setting operands can be set to their default value simply by omitting any reference to them, the value of a persistent operand can only be changed by making an explicit or implicit reference to the operand in the command.

Syntax errors If an error is detected in the syntax of a command, HANS will repeat the text of the command line up to the point at which the error was detected (which will be indicated by placing a '*' after the last correct character read), followed, on a separate line, by the message:

HANS: ERROR

No recovery is attempted. The user must enter a correct version of the command line. Sending '?' to HANS at this point will produce extra diagnostic messages if these are available.

This command provides a means of controlling when messages from services or operators on the HANS network are to be displayed at a user's terminal. The command allows a user to prevent all but the most urgent messages from interfering with the dialogue between user and service. It also provides a means for discovering if messages have been presented while the user was unwilling to accept them.

ACCEPT	Level =	$\left(\begin{array}{c} \text{General} \\ \text{Information} \\ \text{Warning} \\ \text{Alarm} \end{array} \right)$
	Fix =	$\left(\begin{array}{c} \text{Yes} \\ \text{No} \end{array} \right)$

- Level** This operand defines the level at which messages are to be displayed on the terminal (interspaced within lines of the current service dialogue). If a level of *General* is specified, all messages directed to the terminal will be displayed. If a level of *Information* is specified, only those messages with a defined level of *Information* or higher will be displayed. Similarly for *Warning* and *Alarm*. It should be noted, however, that setting a level of *Alarm* does not prevent *all* messages from appearing; certain system messages which are classified as being imperative for all users will be displayed even on terminals with a defined level of *Alarm*. The display of a message will not interfere with the service dialogue except by modifying the output format.
- Fix** This operand is used to specify whether the level set in the current command is to be stored for future use. If the terminal connection is hardwired, the level for message acceptance can be stored so that it applies for all future HANS sessions until it is reset. If the change in level is to take effect for the current HANS session only, specify *Fix=No*.

Notes

Each time the ACCEPT command is executed, whether the level is changed or not, a *missed-message* report will be generated. The ACCEPT command produces a report of the form:

NO MESSAGES MISSED

or

nn MESSAGES MISSED; AT LEAST ONE xxxxxxxx MESSAGE

where, 'nn' is the number of messages that would have been displayed but for the level currently set for the terminal, and 'xxxxxxx' indicates the level of the highest level message that was missed.

If the ACCEPT command shows that messages were missed, it is necessary to CONNECT to the MESSAGE Service (DISCONNECT from current host service first) in order to see the text of those messages.

CONNECT

This command causes a bid to be made to connect the user's terminal to the service specified here if the terminal is not already connected to a service.

CONNECT

To = *service-name*

Logon-text = *Logon-Command-Text-String*

To The service name of the service as it is defined for the HANS network. Typically this will be a three or four letter abbreviation like MES, HUW, VSPC or TSO.

Logon-text The text of a valid logon command for the service expressed as a string within single-quote characters. The string may have up to 64 characters; the whole CONNECT command must be complete within one line.

The operand provides a means of speeding up the process of logging on to the service by avoiding unnecessary dialogue. The Logon-text, if specified, will be passed to the service as a logon command for the service. The user is responsible for ensuring that the syntax of the text meets the requirements of the service. No checking will be done by HANS. If the logon text is complete and correct, the service will log the user on without further prompting. If the logon text is incorrect or incomplete, the service will prompt for missing data.

Notes

If the first word on any input command line does not correspond to a recognisable HANS command verb, the command will be assumed to be a CONNECT command and the input line will be treated as operands for this command. This is done because the commonest service that HANS is likely to perform for its users is to connect them to other services. It means, however, that mistyping of other command input may give rise to error messages and prompts appropriate for CONNECT. If this should happen, enter *attention* (CTRL+'A'), *if necessary*, to exit from HANS command processing, then enter the correct command in the usual way.

Messages

HANS: xxx SERVICE NOT KNOWN

The service name (*To* operand), or its abbreviation xxx, given in the CONNECT command is not known on the network. Check that the name has been entered correctly. The service in question may not be in operation yet.

HANS: xxx IS UNOBTAINABLE

The service specified is unable to accept logons at this time. Check the operational hours for the service in the directory.

HANS: xxx SERVICE IS BUSY, TRY AGAIN LATER

The service specified is active but its handler already has the maximum allowed number of users from the HANS network.

HANS: ALREADY LOGGED ON TO xxx

You are already logged on to the service stated here. Logoff and disconnect from that service before re-entering the CONNECT command. HANS does not allow more than one connection to be in existence at any one time.

HANS: ERROR IN CONNECT. TRY AGAIN LATER.

An error has occurred while processing your CONNECT. Please try submitting the command again. Since the error may be due to temporary overload conditions, allow a few minutes between attempts. If the message persists, contact Computer Reception.

DISCONNECT

This command causes the network connection formed by an earlier CONNECT command to be broken. If there is an active service session at this time, it will be discontinued (a logoff/logout will be performed automatically).

DISCONNECT *no operands*

DISCONNECT

Messages

HANS: CONNECTION BREAKING (USER HAS ISSUED DISCONNECT)

Normal message after a DISCONNECT command when there is a service connection. The service session will be terminated at this time but the HANS session will continue.

HANS: SESSION BREAKING (USER HAS ISSUED DISCONNECT)

Normal message after a DISCONNECT command when there is no service connection. The HANS session will be terminated at this time.

HANS: CONNECTION BREAKING (USER HAS PRESSED BREAK)

Normal message after a break control has been entered. This control has the same effect as a DISCONNECT command, so the interpretation of the message is identical to that for the first message above.

HANS: CONNECTION BREAKING (TIME-OUT)

This message appears when there has been no activity on a service session for a defined period of time (the *time-out* interval). The service session is terminated.

HANS: CONNECTION BREAKING (BREAK ISSUED BY REMOTE)

The service handler (the *remote* partner in the current service dialogue) has issued a break control. The effect is similar to a user issuing break control – the service session is terminated. This is the normal action for a service handler to take when a user issues a (service specific) logoff command or signal, or when the service takes the initiative to terminate the user's session for any reason.

HANS: CONNECTION BREAKING (BREAK ISSUED BY HANS)

The terminal handler has issued a break control. The effect is similar to a user issuing break control – the service session is terminated. This message should only appear when there is a fault or overload in the terminal handler. Please tell Computer Reception if this message is repeated.

HANS: SESSION BREAKING (*Reason*)

Messages of this type are produced when the HANS session rather than the service session is terminated. Possible *reasons* include USER PRESSED BREAK, and TIME-OUT.

This command provides tutorial messages about HANS facilities.

{HELP}	Commands
{ ? }	ACCEPT
	CONNECT
	DISCONNECT
	HELP
	SEND
	SHOW
	SPEED
	TERMINAL
	(<u>Function</u>)
	(Operands)

Notes

The character '?' can be used in place of the HELP command verb.

Further keywords will be added to this command as the system develops. Enter:

```
HANS>help help
```

or

```
HANS>? help
```

to get up-to-date information.

This command provides a means for sending a short message to a HANS network operator. The MESSAGE service (see section 6.2) should be used for longer messages and to send messages to other users.

SENDText = ' *message-text* '

Text The text of the message to be sent to the operator must be given as a character string (i.e. enclosed between single quote characters).

Operation

The message text is sent to the operator at a level equivalent to *general* (see ACCEPT), but the network operator is not able to prevent the message from being displayed eventually.

This command displays terminal characteristics.

SHOW

(Current
Stored
Profile-name)

All

Mode

End-of-Line

End-of-Message

Line-Length

Page-Length

Tab-Width

Delete-Action

Auxiliary

Device-On

Device-Off

Graphic-Set-Extension

Standard-Graphic-Set

Echo

Pad

Current Indicates that the characteristics to be displayed are those which are currently in use as distinct from those stored for permanent use.

Stored Indicates that the characteristics to be displayed are those which have been stored for permanent use as distinct from those that may have been temporarily selected for current use. In the case of terminals on switched or shared lines, the characteristics stored for permanent use are those applying at the initial activation of the line for the current session.

Profile-name Certain sets of terminal characteristics are stored by name. Specifying the name of

such a set (within single quote marks) will cause the values of the characteristics in the set to be displayed.

- All** Indicates that a report on all characteristics is to be displayed. This will apply if no further selection of characteristics is made; if one or more specific characteristics keyword is entered with the command, only the settings of the specifically selected characteristics will be displayed.

Note

Whenever the **TERMINAL** command allows a characteristic to be set, the **SHOW** command will allow that characteristic to be displayed. Hence a **SHOW** command with 'All' selected, will display all the characteristics that can be set in **TERMINAL** commands.

SPEED

This command allows the transmission speed of the terminal to be changed if the hardware and operating policies permit.

Input speed can be changed independently of output speed if the terminal hardware allows this.

The operation of this command demands care since incorrect manipulation at the terminal could lead to loss of useful communication with the network.

SPEED Both = *input-and-output-speed*
 Input = *input-speed*
 Output = *output-speed*
 Fix = $\left(\begin{array}{c} \text{Yes} \\ \text{No} \end{array} \right) \left(\begin{array}{c} \text{Baud} \\ \text{Characters-per-second} \end{array} \right)$

Both Indicates that both input and output speed are to be set to the same value and provides that value.

Input Specifies the input speed.

Output Specifies the output speed.

Fix If it is possible to store terminal characteristics for permanent use (see the description of the **TERMINAL** command for the conditions required for this), then this operand provides a means of choosing whether the change of speed is to be temporary or permanent. If it is not possible to store the terminal characteristics, the **Fix** operand has no effect. If it is possible to store terminal characteristics, then, if **Fix** is specified as 'Yes' (or is defaulted), the new speeds will be stored for permanent use; to make a temporary change in speed (for the current HANS session only) enter 'Fix=No'.

$\left(\begin{array}{c} \text{Baud} \\ \text{Characters-per-second} \end{array} \right)$ These operands are used to specify the units in which speed is measured. *Baud* indicates that speed is measured in *baud*; i.e. one signal unit (normally one binary digit or *bit*) per second. This is the unit commonly used to label speed switches on terminals and is the default unit in HANS. *Characters-per-second* indicates that speed is to be measured *characters per second* (cps); this unit is sometimes used to label speed switches on terminals.

The standard speeds available on HANS are:

110, 150, 300, 600, 1200, 2400, 4800, and 9600 baud

or the equivalent in characters per second:

10, 15, 30, 60, 120, 240, 480, and 960 characters per second.

SPEED

Some terminals will be restricted to a subset of these speeds depending on operational requirements.

Operation

On receipt of the command, provided the selected speeds are suitable, sets the *input* speed to the new value and outputs one of the following messages *at the old speed*:

```
HANS : SPEEDS ( BAUD ) xx IN , yy OUT , OK? REPLY ' YES ' OR ' NO ' >
```

or

```
HANS : SPEEDS ( CPS ) xx IN , yy OUT , OK? REPLY ' YES ' OR ' NO ' >
```

(depending on the speed units selected) then sets the *output* speed to the new value (i.e. *yy*).

At this stage the HANS hardware is set at the new speeds. The user must therefore switch his terminal to the new speeds *before* replying to the prompt. When the switch has been done, the reply will be correctly echoed to the terminal (provided that echo is on – use CTRL+'Y' if it is not). The user should ensure that a correct echo of his reply has been obtained before attempting to enter end-of-message. Indeed the end-of-message character cannot be detected correctly unless the input speed (at least) is correct. Entering 'No' or Attention *at the correct input speed* will cause HANS to output (*at the new output speed*) a message of the form:

```
HANS : RESTORE SPEEDS (units) TO IN ii OUT oo , PRESS RETURN WHEN COMPLETE>
```

HANS then resets to the old speeds (i.e. *ii* and *oo*) to read the reply. When the speeds have been adjusted and RETURN (Carriage Return – CR) has been entered at the correct speed, HANS will output (at the old speed) a message of the form:

```
HANS : SPEED (units) IS STILL ii IN oo OUT
```

If BREAK is entered before the reply to the prompt is complete, HANS will reset to the old speeds immediately but will also disconnect any service session that is in existence or will disconnect the HANS session, if there is no service session at this time. Note that the normal messages (see DISCONNECT for details) produced for these events will be delivered at the *old* speeds because it is assumed that the speed has not been changed. If the HANS session is disconnected, the speed assumed for the next activation of the line following the disconnect message is the initial or permanent value stored for the line. Thus BREAK, which can be detected at any speed, provides a means for recovery from a speed change that cannot be followed through to a normal conclusion, but it carries the penalty that either the service session or the HANS session will be lost as a consequence. Users should not attempt a speed change while they have a active service session unless they are prepared to abandon this session should the need arise to use BREAK.

SPEED

Messages

In the following messages the entry shown as *units* is either BAUD or CPS (characters per second); if the user specified the terminal speed in baud, the system message will use BAUD units; if the user specifies terminal speed in characters per second the system message will use CPS units.

HANS: SPEEDS (*units*) *xx* IN *yy* OUT, OK ? REPLY 'YES' OR 'NO' >

Prompt issued *at the old speed*. At this time the HANS hardware changes the speed of the transmission line connected to the terminal. The user should change the speed of the terminal before replying to the prompt. If the reply to the prompt is correctly echoed to the terminal, the speeds have been correctly adjusted.

HANS: SPEED SPECIFIED IS OUT OF RANGE
HANS: MAXIMUM SPEEDS (*units*) ARE *xx* IN *yy* OUT

The user has specified a speed that is greater than the maximum speed defined for the particular transmission line to which the terminal is connected. The second message states the maximum speed(s). No change in terminal speed will be made until the user enters a SPEED command specifying a suitable speed.

HANS: SPEED SPECIFIED IS NOT PERMITTED
HANS: PERMITTED SPEEDS ARE *units*

The user has specified a speed that is not one of the set of standard speeds supported by HANS. The second message states which speeds are supported. No change in terminal speed will be made until the user enters a SPEED command specifying a valid speed.

HANS: RESTORE SPEEDS (*units*) TO IN *xx* AND OUT *yy*, PRESS RETURN WHEN COMPLETE >

This message appears if a response other than BREAK or yes (or an abbreviation of this) is entered in response to the speed change prompt (first message above). This message will be output at the *new* output speed. Note that the message is not issued if the reply to the speed change prompt is BREAK.

HANS: SPEEDS (*units*) ARE STILL *xx* IN *yy* OUT

This message is issued after a correct reply has been received to the immediately preceding prompt. The message is issued at the speed specified here for output. This message will be issued *at the old speed* if the reply to the speed change prompt is BREAK.

HANS: FAILED TO SET LINE SPEED

This message indicates an error in the terminal driver software. Check that the speed(s) specified in the SPEED command are valid then try the command again. If the message persists, please tell Computer Reception.

HANS: FAILED TO GET LINE SPEED

This message indicates an error in the terminal driver software. Check that the speed(s) specified in the SPEED command are valid then try the command again. If the message persists, please tell Computer Reception.

This command allows the user to change the terminal characteristics. The changes can be made on a temporary basis or, if the terminal is permanently connected to the HANS network, permanently.

TERMINAL	Like =	$\left(\begin{array}{c} \underline{\text{None}} \\ \text{profile-name} \end{array} \right)$
	Mode =	$\left(\begin{array}{c} \underline{\text{Roll}} \\ \text{Page} \\ \text{File} \end{array} \right)$
	End-of-Line =	$\left(\begin{array}{c} \underline{\text{LF}} \\ \text{CR} \end{array} \right)$
	End-of-Message =	$\left(\begin{array}{c} \underline{\text{CR}} \\ \text{LF} \end{array} \right)$
	Line-Length =	<i>Number of characters on a line</i>
	Page-Length =	<i>Number of lines on a page</i>
	Tab-Width =	<i>Number of characters in tab field</i>
	Delete-Action =	$\left(\begin{array}{c} \underline{\text{Show}} \\ \text{Hide} \end{array} \right)$
	Auxiliary =	$\left(\begin{array}{c} \underline{\text{Off}} \\ \text{On} \end{array} \right)$
	Device-On =	$\left(\begin{array}{c} \underline{\text{DC1}} \\ \text{DC2} \\ \text{DC3} \\ \text{DC4} \end{array} \right)$
	Device-Off =	$\left(\begin{array}{c} \underline{\text{DC3}} \\ \text{DC4} \\ \text{DC1} \\ \text{DC2} \end{array} \right)$
	Graphic-Set-Extension =	$\left(\begin{array}{c} \underline{\text{TYPEAPL}} \\ \text{BITAPL} \\ \text{etc.} \end{array} \right)$
	Standard-Graphic-Set =	$\left(\begin{array}{c} \underline{\text{G0}} \\ \text{G1} \end{array} \right)$
	Echo =	$\left(\begin{array}{c} \underline{\text{On}} \\ \text{Off} \end{array} \right)$
	Pad =	<i>Number of padding characters after CR</i>
	Fix =	$\left(\begin{array}{c} \underline{\text{Yes}} \\ \text{No} \end{array} \right)$

Like This operand allows terminal characteristics to be defined as identical to those of one of a limited number of named terminal characteristic sets known as *profiles*. A *profile* is a named collection of terminal characteristic values. Certain standard profiles are recognised by HANS (see HANS bulletin for details). This provides a convenient shorthand means for setting characteristics. Its use does not preclude the use of other operands to modify the characteristics. The *None* value is defined for consistency of command syntax; it does not set any characteristics.

Mode This operand defines the mode which the terminal is to be used.
 In *Roll* mode, the terminal provides no page or screen formatting. Each line of text sent to a terminal in Roll mode is displayed on the next available line; in the case of screen terminals, the oldest line on display is rolled off the top of the screen to make room for the new line. This is the default mode because it is the commonest mode of working with simple terminals.

In *Page* mode, the terminal is expected to provide page or screen formatting support. With a Page mode terminal, the messages are accompanied by instructions that control the layout of the message on the page or screen.

In *File* mode, the terminal is considered to be capable of receiving files of data from a service (e.g. for distributed data processing). As in the case of Page mode terminals, the messages are specially formatted to simplify further processing.

At present, HANS supports only Roll mode terminals, so this operand has no effect.

End-of-Line Specifies the character to be used as an end of line marker or delimiter. Two choices are possible,

LF Line Feed is the end of line delimiter.

CR Carriage Return (marked as *Return* on some keyboards) is the end of line delimiter.

Note that if the same character is chosen as end of line and end of message delimiter, each message can only be one line long.

End-of-Message Specifies the character to be used as an end of message marker or delimiter. Two choices are possible,

CR Carriage Return (marked as *Return* on some keyboards) is the end of message delimiter.

LF Line Feed is to be the end of message delimiter.

Note that if the same character is chosen as end of message and end of line delimiter, each message can only be one line long. CR is the default setting and is the normal end of message for most interactive services. It should only be necessary to change this in special circumstances.

Line-Length Specifies the maximum number of characters in any line of a message. The default value is 72. If a line of text being input reaches this number of characters, the line will automatically be considered complete even although no end-of-line character has been entered. The message is not necessarily considered complete at this point.

If the end-of-line character currently selected is the same as the end-of-message character, the message is considered complete and is dispatched to the service handler. Otherwise, HANS will mark the end-of-line for the service handler, and will prepare to read a further line from the terminal to continue or complete the message. The results of sending a message that exceeds the capacity of the service are unpredictable.

Page—Length Specifies the number of lines of text on a 'page' of output to the terminal. The default value is 20.

Although this operand is , strictly speaking, part of the format definition of a Page mode terminal, it can be used to good effect on a Roll mode terminal. Defining a Page Length for a Roll mode terminal causes long messages output to the terminal to be split up into page-sized pieces for display. Hence, if the terminal has a screen able to display 24 lines of text, the default setting of Page Length will cause output to the terminal to be suspended after each set of 20 contiguous lines has been displayed (see section 3.3 for details of suspend control). This allows the message to stay on the screen long enough to be read at the user's leisure. The user enters the restart control (CTRL+'Q') to see the next part of the message.

If a value of *zero* (0) is specified for Page Length, no output suspension will occur. This is a suitable value for hardcopy terminals, especially those used for printing listings.

Tab—Width Specifies the number of character positions in each Tab field. The input line is considered to be divided into a number of contiguous fields, each field consisting of the same number of contiguous character positions. When the Tab control (CTRL+'I') is entered space characters (blanks) are inserted into the input line so as to bring the current typing position (the position at which the next input character will be entered) to the first character position of the next Tab field. This action is described as 'tabbing to the next field'.

The default value of this operand is *six* (6); the input line is thus divided into fields of six characters each.

Delete—Action Specifies whether, when the Delete Character control (DELETE, RUBOUT or ERASE) is entered, the character that is deleted is to be shown or hidden. With the *Show* option, the delete control causes the character(s) that have been deleted to be displayed at the terminal between backslash ('\') characters. With the *Hide* option, the delete control causes the character(s) that have been deleted to be removed (hidden) from display. For the Hide option to work correctly, it is necessary that the terminal has a screen; the Hide option in fact causes the sequence 'backspace, space, backspace' to be sent to the terminal for each character to be deleted.

Auxiliary Specifies whether auxiliary mode is on or off. When auxiliary mode is on, each time data can be entered from the terminal HANS will issue a Device—On control character to the terminal and HANS will also issue a Device—Off control character at the end of each input. (See below for the selection of Device—On and Device—Off control characters.) This mode is intended to enable controlled entry of data from auxiliary devices attached to the terminal (e.g. paper tape readers, cassettes, floppy disks). Whether auxiliary mode is on or not, HANS will suspend output to the

terminal at the end of the current line set if the current Device-Off control character is sent to it, and will resume output when the current Device-On control character is sent to it (see 3.4). This can be used to control output to the terminal, or one of its auxiliary devices.

Device-On Selects which of the ASCII device control codes DC1, DC2, DC3, DC4 is to be used to begin data transfer from the terminal in auxiliary mode or to resume output data transfer from HANS. The default value, DC1 or XON, is strongly recommended if there is any choice in setting up the terminal. The value chosen here must also be used when manually controlling output to the terminal; i.e. it will replace the standard CTRL+'Q' HANS control for resumption of output (see 3.3). DC1, DC2, DC3, DC4 correspond respectively to CTRL+'Q', CTRL+'R', CTRL+'S', CTRL+'T'.

Device-Off Selects which of the ASCII device control codes DC3, DC4, DC1, DC2 is to be used to stop data transfer from the terminal in auxiliary mode or to suspend output data transfer from HANS. The default value, DC3 or XOFF, is strongly recommended if there is any choice in setting up the terminal. The value chosen here must also be used when manually controlling output to the terminal; i.e. it will replace the standard CTRL+'S' HANS control for suspension of output (see 3.3). DC1, DC2, DC3, DC4 correspond respectively to CTRL+'Q', CTRL+'R', CTRL+'S', CTRL+'T'.

Graphic-Set-Extension Specifies which of a limited list of named character set extensions is to be used to replace the graphic characters in the standard ISO 646 International Alphabet 5 used for other HANS transactions. Only one extended set is allowed to be in force at any one time. This set is referred to as the *alternate* set. The alternate set can be assigned as the G1 graphic set or as the G0 graphic set; the standard set must be assigned to the opposite graphic set (G0 or G1) from the alternate set. The G1 set is brought into use by entering a Shift Out control (CTRL+'N') and the G0 set is restored by entering a Shift In control (CTRL+'O') (see Standard-Graphic-Set below). Of the sets named so far, TYPEAPL is the typewriter-paired APL character set used, for example, by DECwriter and Tektronix terminals, and BITAPL is the bit-paired APL character set used, for example, by Newbury Labs 7007s and Hewlett-Packard terminals. Other extended character sets will be added to HANS as required. (See 7.3 for details of character sets.)

Standard-Graphic-Set Specifies which of the two alternate graphic character sets contains the standard graphics of International Alphabet 5 - G0 or G1. ISO Standard 2022 recommends that the standard graphics be assigned to the G0 set and this is the HANS default. If the terminal manufacturer has chosen to assign the standard graphics to the G1 set, the Standard-Graphic-Set parameter must be set to G1. Of terminals in common use, the DECwriter APL character set extension is assigned as G0. For the DECwriter APL terminal, the Standard-Graphic-Set must be set as G1. The Newbury Laboratory 7007 and the Tektronix 4015 APL sets are assigned to G1; for these terminals the *Standard-Graphic-Set* default is satisfactory.

- Echo** Specifies whether characters input from the terminal are to be echoed to the terminal (Echo On) or not (Echo Off). The default is On; all characters input from the terminal are echoed.
- This operand can be used to inhibit echoing of input characters to terminal that operate in half-duplex mode. In these terminals, the terminal itself displays each character as it is input; with normal echo from HANS, this would cause every character to appear twice on the terminal display. The control of echoing provided by this operand extends until a subsequent execution of the TERMINAL command changes the option. This is in contrast with the echo controls (CTRL+'X' and CTRL+'Y') which have an effect for the current line only.
- Note that, from time to time, services inhibit echoing at the terminal (e.g. while a password is being entered). The inhibition ordered by the service has a purely temporary effect; it does not change the echo option as specified in the terminal command.
- Pad** Specifies the number of padding characters (NUL characters) that are to be sent to the terminal after each carriage return character has been sent. The output of these characters allows time for the carriage on slow terminals to return to the left hand margin before further output is sent.
- The default value is 0 (*zero*). Any integer value up to seven (7) may be specified.
- Fix** Specifies whether the changes introduced by this use of the TERMINAL command are to be temporary (Fix=No) or are to be stored for use in all subsequent HANS sessions (Fix=Yes).
- Only those terminals that are permanently connected to the HANS network are allowed to store terminal characteristics for use in future HANS sessions. All other terminals are given a default set of characteristics when they startup on the HANS network; the user can change these characteristics using the TERMINAL command but the changes are in effect for the current HANS session only.
- Hence the Fix operand is only effective for terminals permanently connected to the HANS network. For any other terminals, the setting 'Fix=Yes' will be ignored.
- Note that for terminals permanently connected to HANS, the default option is 'Fix=Yes'. For these terminals, temporary changes require 'Fix=No'.

Note that the only operand of TERMINAL available in early releases of HANS is Page Length.

7.3 Character Sets

This section contains reference tables for the character sets HANS supports. A brief introduction to character set standards is given here.

The standard 7 bit representation of a character code has bits labelled b_7, b_6, \dots, b_1 with b_7 as the high order bit and b_1 as the low order bit. The eighth bit (b_8) is reserved for parity. The characters are shown in tabular form within rows and columns. The decimal equivalent of the binary number formed by bits b_7, b_6 and b_5 , collectively, forms the column number, and the decimal equivalent of the binary number formed by bits b_4, b_3, b_2 and b_1 , collectively, forms the row number. The code table position for any given character (e.g. K) is referenced by the notation "column *column-number*, row *row-number*" character or *column-number / row-number* character (e.g. K is the *column 4, row 11* character, or the *4/11* character). The hexadecimal value of the character code is given by expressing the column number and the row number as hexadecimal digits then writing these digits in the order *column-number row-number* (e.g. K has hexadecimal value 4B).

The bit representation for K is

b_7	b_6	b_5	b_4	b_3	b_2	b_1
1	0	0	1	0	1	1

For asynchronous transmission, character codes are sent as a sequence of bits starting with a *start-bit* (zero), b_1, b_2, \dots, b_7 , parity bit (b_8), then one or two (110baud only) *stop-bit(s)* (one(s)). On HANS, the parity bit is *ignored*.

The code table is subdivided into an area for control characters in columns 0 and 1, with the space character in position 2/0 and the delete character (DEL) in position 7/15; the remaining positions form the area for a graphic character set. Initially a graphic character set known as G0 is assumed in columns 2 to 7. But if a *shift out* control, SO (0/14), is received, a new set known as G1 is assumed to exist in columns 2 to 7, and bit combinations from these columns cause the printing of characters from this set until a *shift in* control, SI (0/15), is received. The (single) alternate graphics set is defined by sending an *escape sequence* (i.e. the *escape* control ESC, followed by one or two further characters). In the case of HANS, this is simulated by entering a TERMINAL command. (See 3.7. and the TERMINAL command.)

HANS supports the ASCII (American Standard Code for Information Interchange) variant of the International Standardization Organisation 646 character set which is also known as the International Alphabet Number 5 (IA5). This variant differs from ISO 646 in only three table positions and then only in choosing a different graphic representation for these characters; the 2/4 (\$), 7/12 (␣), and 7/14 (~) character graphics in ASCII replace the ISO graphics for 2/4 (⌘), 7/12 (␣) and 7/14 (⌘). The ASCII variant was chosen because of its widespread use by terminal manufacturers. Users are warned, however, that some manufacturers deviate slightly from the

code while continuing to describe their product as *conforming to ASCII standards*. Check the manufacturer's representation for codes 2/3, 2/4, 5/12, 5/14, 7/12 and 7/14 in particular. The British variant of ISO 646, known as BS4730, has £ and \$ for the 2/3 and 2/4 positions respectively, and † for 5/14.

American Standard Code for Information Interchange – ASCII

Column → Row ↓	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	Ø	@	P	`	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	-	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	\$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
10	LF	SUB	*	:	J	Z	j	z
11	VT	ESC	+	;	K	[	k	{
12	FF	FS	,	<	L	\	l	!
13	CR	GS	-	=	M	]	m	}
14	SO	RS	.	>	N	^	n	~
15	SI	US	/	?	O	_	o	DEL

APL Character Set for Bit Paired Terminals

e.g. Newbury Laboratory 7007, Hewlett-Packard 2641A. This set is referred to on HANS as BITAPL (see Graphic-Set- Extension feature of TERMINAL command).

Column → Row ↓	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	∅	←	*	→	P
1	SOH	DC1	¨	1	a	?	A	Q
2	STX	DC2	-	2	⊥	ρ	B	R
3	ETX	DC3	<	3	∩	Γ	C	S
4	EOT	DC4	≤	4	L	~	D	T
5	ENQ	NAK	=	5	ε	↓	E	U
6	ACK	SYN	≥	6	-	U	F	V
7	BEL	ETB	>	7	∇	ω	G	W
8	BS	CAN	≠	8	Δ	▷	H	X
9	HT	EM	∨	9	ι	†	I	Y
10	LF	SUB	)	]	◦	◁	J	Z
11	VT	ESC	(	[	'	⊢	K	⊣
12	FF	FS	,	;	□	◇	L	\$
13	CR	GS	+	-	|	{	M	}
14	SO	RS	.	:	T	x	N	÷
15	SI	US	/	\	○	∧	0	DEL

APL Character Set for Typewriter Paired Terminals

e.g. TEKTRONIX 4013, DECwriter. This set is referred to on HANS as TYPEAPL (see Graphic-Set- Extension feature of TERMINAL command).

Column → Row ↓	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	∅	-	*	◇	P
1	SOH	DC1	”	1	a	?	A	Q
2	STX	DC2	)	2	⊥	ρ	B	R
3	ETX	DC3	<	3	∩	∟	C	S
4	EOT	DC4	≤	4	L	~	D	T
5	ENQ	NAK	=	5	ε	↓	E	U
6	ACK	SYN	>	6	-	U	F	V
7	BEL	ETB	]	7	∇	ω	G	W
8	BS	CAN	∨	8	Δ	∩	H	X
9	HT	EM	^	9	ι	↑	I	Y
10	LF	SUB	≠	(	ο	∩	J	Z
11	VT	ESC	÷	[	'	←	K	{
12	FF	FS	,	;	□	⊥	L	→
13	CR	GS	+	×	|	→	M	}
14	SO	RS	.	:	⊥	≥	N	\$
15	SI	US	/	\	○	-	0	DEL