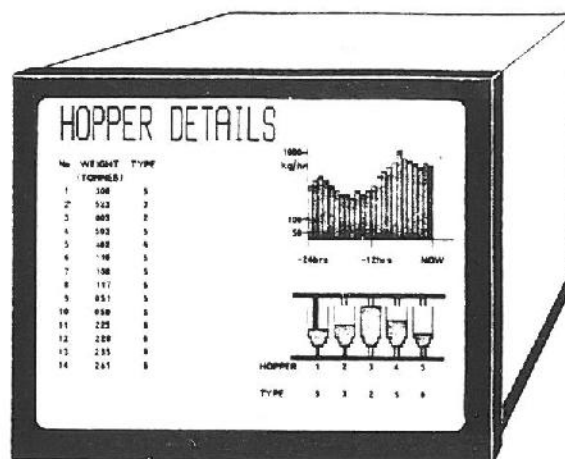


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1 Introduction

1.1 SCOPE OF THIS DOCUMENT

This leaflet is provided as a reference document for a user preparing pictures for display on a video monitor.

Since the GEM80 video system is only usable as part of a Micro-controller, e.g. GEM80/235, the user should refer to the User Information Leaflet for that product for details of the host controller.

The information in this document is applicable to modules 8204-4003 and 8603 4004, the latter fitted with issue C or later EPROMS.

The GEM80 paged video is capable of working with both GEM80/235 (or similar) controllers and the GEM80/250 family. The video must be correctly configured to operate with the host controller - this is dealt with in section 3.6.3. When loading a tape from an existing video into a video in a 250 host it may be necessary to follow the configuration sequence to obtain the correct display.

Alternative character sets may be supplied with different versions of the 8204 module.

A set of design aids is provided as Appendix B at the end of this leaflet. The user is advised to make copies of those pages, fill them in as appropriate, and retain the completed print as part of the design records for the job.

Pocket quick reference cards are available on request.

1.2 DESCRIPTION

A video system comprises a video processor module and (optionally) one or two additional memory modules which plug into the central subrack of a host GEM80 controller.

The video memory modules store a program entered by the user which defines the structure of the picture ("format data") and the contents of each possible picture ("format definitions").

The screen may be partitioned into up to four parts ("format areas") each of which displays a different picture ("format") requested by the host controller.

The format definitions can include variable data instructions ("Data Reference Numbers" or DRNs) which extract and display data from the externally accessible data tables of the host controller.

The video processor performs a free-running repetitive cycle independent of the cycle time and status of the host controller. On each scan it reads the L table and obeys any request for different formats.

The name "Paged video" of this system is derived from the fact that the format program is stored in 16Kbyte "pages" in the memory modules. The 48K memory module supplied as standard with a GEM80/225/235/245 or one of the 64K modules supplied with a GEM80/252/253/254 includes the first page of video memory (page 0). Optional extra 64K memory modules each provides four additional pages of video memory (pages 1-4, 5-8 respectively).

The video output is a matrix of 80 x 24 cells each displaying a symbol from the character set. Each cell also has an "attribute code" which defines a choice of colours, flashing and/or reverse video.

For GEM80 Controllers with capacity for more than one video processor module it is possible to have simultaneous display of a different picture from each processor module. Under these conditions the video memory modules are common to the system; the same format definitions and format data apply to all the video processors.

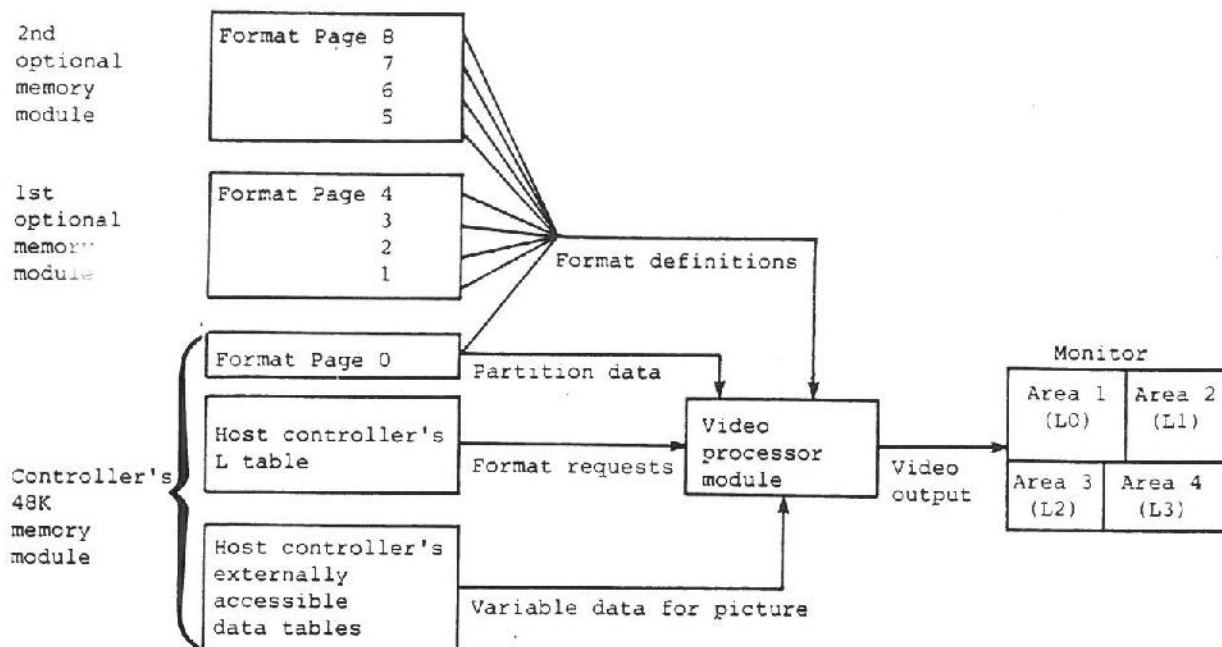


Fig.1a Block diagram of paged video system

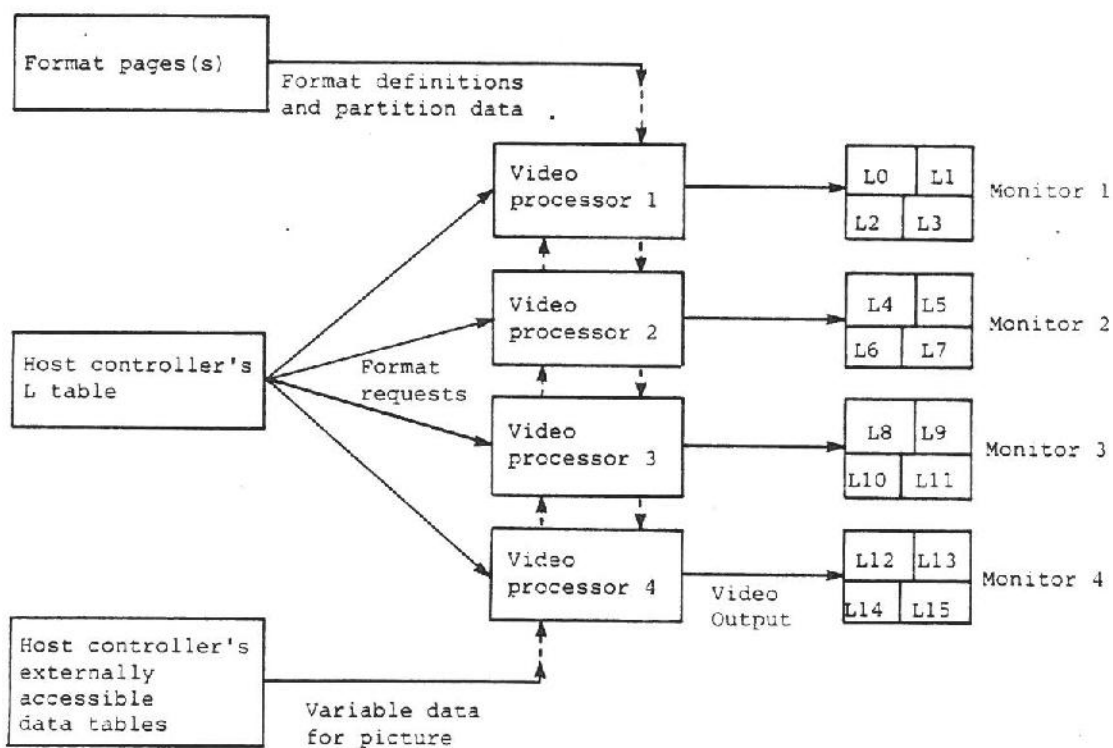
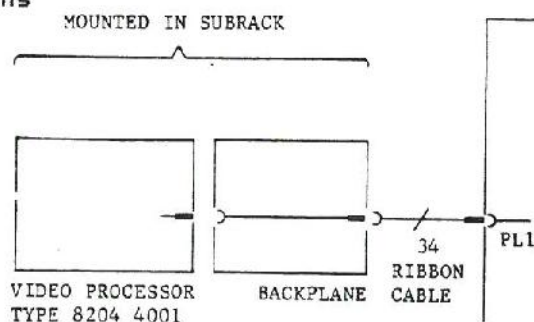


Fig.1b Block diagram of multiple video system

2. Connections



Ribbon cable details:-

34 way twisted pairs

Mechanical code pin 4

Length 2m standard, 5m maximum.

Coaxial cable details:-

Socket on termination panel

75 ohm BNC; 75 ohm cable

recommended (50 ohm suitable).

Cable length up to 200m using cable types URM70 or RG59B/U.

Cable length up to 500m using cable type URMS7, but requires adapter to connect large cable to BNC connector.

Typical colour monitors have pairs of BNC sockets for each signal, which may be used for looping between monitors, and a switch for connecting a terminating resistor, which should be in circuit only at the last monitor in the chain.

Printer cable details:-

0.5mm cores, twisted pair with screen recommended. Cable length up to 5km; twisting and screen unnecessary for cable length <20m.

Note link on termination panel supplied by user.

Table 2.1 Printer specification

20mA current loop.

300 bit/s.

No parity checking.

At least 80 characters per line.

ASCII/ISO 7 character set.

ISO code @0A (LF) should produce line feed only

ISO code @0D (CR) should produce carriage return only

Video system outputs (CR) (LF) at the end of each line; blank lines will appear if printer produces line feed for both characters.

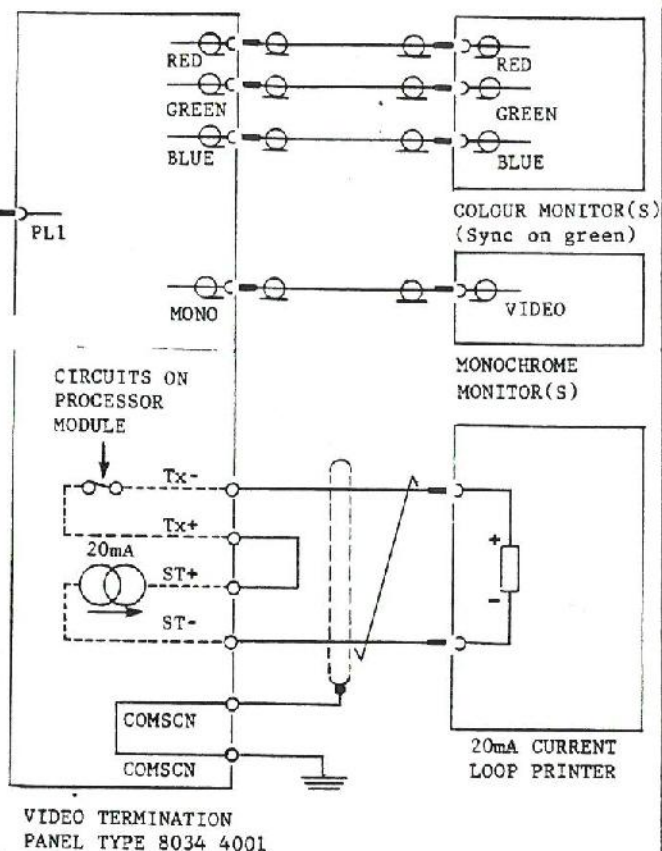


Fig 2.2 User connection details

3. Operating Procedures

3.1 Preparing pictures for programming.

Users are advised that it is highly advantageous to prepare the desired pictures carefully before attempting to program the video formats.

1. Sketch desired pictures (design aid use copies of page A1).
2. Choose partition lines to divide pictures(s) into individual formats (design aid-see page 9 for rules and examples).
3. Divide formats into groups for each 16K page of memory. Typically a page can contain 8 complicated full screen formats, or up to 25 simple formats.
4. Allocate format numbers consecutively from one for page 0, consecutively from 26 for page 1, consecutively from 51 for page 2, etc.
5. Prepare format data (design aid-use copy of page 28).

3.2 To prepare portable programmer

Standard GEM80 programming units are suitable for use with either the video system or the host micro controller, depending on which module the connecting lead is inserted into. They have no influence on the host controller while it is connected to the video system. The following procedure applies to portable programmer 8920; the procedure for the system programmer 8922 is very similar.

1. Check/adjust mains voltage setting at rear of programmer.
2. Connect programmer to AC supply.
3. Make connection from programmer (lead end marked PROG) to Video processor front panel (lead end marked GEM).
4. Check that programmer has key inserted at rear. For 8920 programmer ONLY, turn key away from "MONITOR ONLY" position.
5. If using audio tape load/dump make connection from programmer to cassette tape recorder. Keep tape recorder away from stray magnetic fields i.e. NOT resting on top of the programmer.
6. Programmer will display a message of the form: "CONNECTED TO GEM80 VIDEO x. SET FOR <type> HOST"; where 'x' is the video number in the range 1-4, and <type> is "250 SERIES" or "235 (or similar)" as defined by the current configuration.

IMPORTANT. Do not leave programmer lead plugged into video processor except when using programmer. This is because a link in the programmer lead enables the video processor to write to (any) memory locations, and under fault conditions it may be possible for the video system to

interfere with the operation of the host controller.

3.3 To load formats from magnetic tape.

While new video formats are being loaded, the host controller will continue running normally. It is unaffected by commands (e.g. halt) issued to the video processor. (During loading, the video processor will continue to display and update the previously requested formats. The processor is not allowed to read format definitions while they are being loaded, so any change in the formats requested will result in the display of format zero. (Screen full of GEM80s).

The replay time for video formats is proportional to the program size. The rate from audio cassette is approximately 330 P table locations per minute, ie about 25 minutes for one full page of memory (8192 locations). The rate from digital tape is approximately 2000 P table locations per minute, ie about 4 minutes for one full page of memory.

As replay proceeds, the programmer screen will display the title block to identify the tape. If the tape was recorded via a portable programmer, the title will include "THIS TAPE IS FROM GEM 80 NO. ***" where *** is the decimal value of the contents of location PD. Unlike control programs, PD for a video program cannot be set by the user as a system identification code, because it contains partition data. The user is advised to identify the tape by means of date, operator name and issue no. information displayed on the programmer screen. If desired this can be supplemented by speech recorded onto the end of the tape using a microphone.

1. Connect programmer to video processor (see 3.2).
2. Select programmer option "LOAD VIDEO FORMATS FROM MAGNETIC TAPE TO GEM80".
3. When prompted press "H" to simulate controller halt. This has no effect on video processor which does not use halt/run status, but it is necessary before programmer will permit loading from tape.
4. When prompted "...DO YOU WANT TO CLEAR THE STORED PROGRAM?" reply "NO". Tape loading will in any case over write all relevant P locations.
5. Press programmer "space-bar" and start cassette recorder.
6. When loading has finished, check that programmer indicates "NO ERRORS". Reload if errors detected.
7. Press "T" to terminate tape loading option. Programmer will prompt "PRESS R TO RUN GEM 80, X TO SKIP". R is recommended for consistency, though it has no effect on video display.
8. Sometimes after loading from tape it

is necessary to re-initialize the video system to obtain the new display. If picture freezes full of GEM 80's then go to edit mode and terminate immediately or switch power OFF/ON to restart video system.

9. Disconnect programmer.

3.4 To obtain display on video monitor.

The functioning of the video system can be checked, before any video formats have been programmed, by making use of format zero, which is stored permanently within the video processor. Format zero should appear as 8 columns of "GEM 80", coloured (from left to right) blue, green, light blue, red, purple, yellow, white, white reverse video. On monochrome monitors all "colours" appear white.

When video formats have been programmed, a video picture can be obtained by setting the appropriate format numbers in the L table of the host controller.

1. Connect video monitor to video termination panel.
2. Set contents of location LD in host controller to zero to request format zero. (Use L4 for 2nd video processor, L8 for 3rd, L12 for 4th)
3. If necessary adjust controls on video monitor - vertical and horizontal hold to obtain steady picture; picture width and height to trim edges of display; brightness and contrast for quality of picture.
4. Load previously prepared formats (if any) from magnetic tape. (see 3.3).
5. Program or edit video formats (see 3.5.8). "TERMINATE" when finished.
6. Set L table of host controller to request desired formats.

3.5 Editor Menu

The GEM80 paged video editor provides a list of options, similar to the portable programmer initial entry selection. Once the GEM80 video edit is entered, the following options will be available:-

- 0 EXTERNAL RAM TEST
- 1 TERMINATE
- 2 SET PAGE NUMBER FOR MAGNETIC TAPE DUMP
- 3 SET CONTROLLER TYPE
- 4 EDIT PARTITION DATA
- 5 CHANGE NUMBER OF FORMAT DEFINITIONS
- 6 DISPLAY SIZES OF FORMAT DEFINITIONS
- 7 CLEAR SELECTED PAGE OF MEMORY
- 8 COPY FORMAT DEFINITIONS
- 9 EDIT/PRINT A FORMAT DEFINITION

These options will be followed by the prompt:-

"ENTER SELECTION NUMBER []"

which enables entry of the required option. (section 3.6 describes these options).

To enter VIDEO EDIT mode:

1. Connect programmer to Video processor. (see 3.2)
2. Select programmer option "EDIT/PRINT VIDEO FORMATS".

It is now possible to select any option from the VIDEO editor menu.

NOTE:- Some prompts are obvious, so they are not explained. Several options require the user to nominate a video page on which the command is to operate. The valid range for page numbers is 0 to 8. Should an invalid number be entered or the memory not be fitted the user will be offered the option of selecting another page or aborting the command.

3.6 Description of Editor Options

3.6.0 EXTERNAL RAM TEST.

This performs a write/read test on a selected memory page (16 Kb) and either gives a message "RAM TESTED AND PASSED" or "RAM FAULT AT ADDRESS @xxxxx VALUE WRITTEN @xx VALUE READ @xx". The address quoted is the video address within the selected page (not the central highway address).

3.6.1 TERMINATE.

This terminates the video edit mode, returns to the portable programmer initial entry selection and re-enables update of the display.

3.6.2 SET PAGE NUMBER FOR MAGNETIC TAPE DUMP.

Each video page has to be stored on a separate side of a cassette tape. In order to use the programmer facility "DUMP VIDEO FORMATS FROM GEM80 ONTO MAGNETIC TAPE" (see 3.7) the video page number to be dumped has to be specified using the editor. If this option is not called before dumping a set of formats the page being dumped will be the last page dumped or loaded by the system, even if the power has been removed in the intervening period.

3.6.3 SET CONTROLLER TYPE.

This option allows the user to configure the host controller type of all the video processors in a GEM80 system. This configuration must be correct or all format requests will be ignored. The configuration information will be dumped to and reloaded from magnetic tape with any page of format definitions. When entered, this option displays the current configuration setting and asks the user if it is to be changed. A simple Yes/No sequence cycles through the available options and returns to the editor menu when the desired setting has been achieved.

3.6.4 EDIT PARTITION DATA.

This option allows the user to set up 4 different areas, or user partitions. A user PARTITION is one of the areas into which the user has divided the screen. (See section 4.1) Selection of this option will prompt as below the first time the system is used. On subsequent selection this option will display current partition data.

"CURRENT PARTITION DATA IS ASSUMED TO BE

AREA	1	1	80	1	24
AREA	2	0	0	0	0
AREA	3	0	0	0	0
AREA	4	0	0	0	0

DO YOU WANT TO CHANGE THIS?

>"

Answer 'YES' to alter size of areas into which formats will fit or 'NO' if formats are designed to be displayed on the whole screen.

Interaction looks like:

- INPUT AREA(1-4)
- INPUT COLUMN DATA(START THEN END)
- INPUT LINE DATA(START THEN END)

N.B. See section 4.1 and exercise 1 in appendix C for a better understanding of this option.

3.6.5 CHANGE NUMBER OF FORMAT DEFINITIONS.

This option is used when the number of formats defined in any page needs to be changed.

Selection of this option will prompt: "WHICH VIDEO PAGE DO YOU WANT TO USE?"

>"

After specifying the page number the prompt will be:

"THE No. OF FORMATS IS XX"

When asked "DO YOU WANT TO CHANGE THIS?" reply "YES" if a change is needed, in which case another prompt "SPECIFY No OF FORMATS(1-25)" will appear on the screen. A number between 1-25 must be entered to set the required number of formats on the selected page.

3.6.6 DISPLAY SIZES OF FORMAT DEFINITIONS.

This option will give a list of the formats in the selected page (16 Kbytes).

The video program is stored as a large preset data table (P table) for each page of memory. Each P table occupies 16 Kbytes of memory. This "private" P table is quite independent of the data tables of the host controller. Each video page has the capacity for 8192 locations.

The video processor automatically adjusts the size of its private P table according to the quantity of program data to be stored. This information is displayed automatically on the programmer as part of the procedures for MAGNETIC TAPE LOAD AND DUMP.

On selecting this option, "WHICH VIDEO PAGE DO YOU WANT TO USE?" will be displayed on programmer screen. Entering the required page number will cause the following information about that page to be displayed: e.g. (suppose only 3 formats declared for page 0)

"SIZE OF FORMAT 1 = 2054 BYTES

SIZE OF FORMAT 2 = 28 BYTES

SIZE OF FORMAT 3 = 6 BYTES

AMOUNT OF AVAILABLE SPACE=14136 BYTES"

Press space bar to return to the list of video editor options. NOTE:- 6 bytes are automatically allocated to each "new" format.

3.6.7 CLEAR SELECTED VIDEO PAGE.

It is not necessary to clear a previously selected video page before loading a set of formats from magnetic tape. It may be convenient to use the clear command when starting to program a completely new set of formats for a selected video page. Note that the clear command to the video system does not set the P table to zero; instead it sets a limited number of P locations to be zero, and deletes the remaining P locations.

This option offers another check to make sure that a RAM is to be cleared by giving the prompt "DO YOU REALLY WANT TO CLEAR A RAM? (Y or N)". This is important since once a page is cleared that page is lost and only be restored by reloading from tape. After confirmation for clearing a RAM has been obtained the page to be cleared has to be selected. Once a valid page number is entered the clearing process is carried out.

The video processor will continue to display the previously requested picture until the format requests in the L table are changed.

3.6.8 COPY FORMAT DEFINITIONS.

This option allows the user to copy one format definition to another. For example the source can be 30 and the destination 85. It should be noted that the copying can be performed only if the number of formats defined in the destination page is large enough for the destination format number to be valid.

This option can also be used as a quick way to clear a format. This is done by copying an empty format to the one to be cleared.

Selecting this option will give the following interaction:

"INPUT SOURCE/DESTINATION FORMAT NUMBER"

>30 85 (as in the example)

"DO YOU WANT TO CONTINUE(Yes or No)"

>

Answer "YES" if more formats are to be copied or "NO" to return to GEM80 video editor menu.

3.6.9 EDIT/PRINT A FORMAT DEFINITION.

Before starting video programming, it is helpful to set up the L table of the host controller so that the new format will appear automatically on terminating or on request during editing using the VIEW facility.

1. Prepare picture for programming (see 3.1).

2. Choose format number to be programmed.

3. Set up L table of host controller to request new format in appropriate format area. (e.g. L0=5, means request format 5 for video monitor 1, area 1).

4. Connect programmer to video processor (see 3.2).

5. Select programmer option "EDIT/PRINT VIDEO FORMATS".

6. Ensure that the number of formats on the page to be used is large enough for the desired format number to exist, otherwise select option 5 to change the number of format definitions.

7. Enter selection number 9 to edit a format definition.

8. When asked for a format number, reply with number of format required.

9. Editor displays minimum partition dimensions required to display the requested format and asks "DO YOU WANT TO CHANGE THIS?". Reply "YES" to alter the minimum size, otherwise reply "NO".

10. When screen displays "IN FORMAT EDIT MODE NOW", use editor commands (see section 5) to build up format definition.

11. Use VIEW command to inspect new picture on video monitor. This command will store the format definition in the video memory module, update the screen and reenter the format edit mode. (VIEW command = V\$).

12. To exit from format edit use the EXIT (E\$) or QUIT command (Q\$). EXIT will store the edited format while QUIT will leave unaltered the previously stored format. (Unless the VIEW command has been used).

13. Select option 1 ("TERMINATE") to return to initial entry selection.

14. Disconnect programmer. IMPORTANT. DO NOT DISCONNECT PROGRAMMER AND DO NOT PRESS SHIFT ? WHILE IN EDIT MODE. (Picture will freeze if you do).

Note.- In a controller with multiple video processors only one at a time can be used for editing purposes. Provided the processor includes sub-module type 8603 4004 (which includes the editor facility) it is immaterial which processor is used for editing.

3.7 To dump formats onto magnetic tape.

Both the video display and the host controller can operate normally while the video format program is being dumped onto magnetic tape, and while a tape is being verified.

The recording time for video formats is proportional to the program size. Audio tape at approximately 330 P table locations per minute takes about 25 minutes for a full page. Digital tape at approximately 2000 P locations per minute takes about 4 minutes for a full page.

If the user wants the tape to include identification of the system from which the recording has been made, it is recommended that this information should be incorporated in the space provided for the operator's name. A typical identification would be the operators' initials followed by an oblique stroke and an alpha code for the system. If desired, supplementary information can be included at the end of the tape by using a microphone to record speech.

Each video page has to be stored on a separate side of a cassette tape. In order to use the programmer facility "DUMP VIDEO FORMATS FROM GEM80 ONTO MAGNETIC TAPE", it is first necessary to specify which video page is to be dumped.

1. Connect programmer to video processor. (see 3.2).
2. Select programmer option "EDIT/PRINT FORMATS".
3. Select video option 2 "SET PAGE NUMBER FOR MAGNETIC TAPE DUMP".
4. When asked, enter the video page number (0-8) to be dumped.
5. Select 1 to terminate editor mode.
6. Select programmer option "DUMP VIDEO FORMATS FROM GEM80 ONTO MAGNETIC TAPE".
7. When prompted, enter date, name and issue. If desired incorporate system identification within "name".
8. When recording completed, it is sensible to verify the tape as prompted by programmer. Reply "YES" when asked "DO YOU WANT TO COMPARE TAPE WITH STORE".
9. When finished return programmer to initial entry selection.

3.8 To print copy of displayed picture.

The screen print facility is primarily intended for logging purposes to record the text and numerical data in a video picture.

The screen print facility should be used with discretion because:-

- a) Double width characters will print as pairs of normal width characters.

b) Triple high characters, bar charts and graphics symbols will print as "*" (asterisks).

1. Connect printer to terminals on video termination panel (Fig.2.2 on page 4).
2. Set data in L table of host controller to request desired formats.
3. When picture is ready for printing alter contents of L0 to request printout (use L4, L8 or L12 for video 2, 3 or 4 of multiple video systems). Set least significant byte of L0 to 0FF e.g. by setting L0 to -1 (0FFFF). Ensure that L0 is changed back to normal format request before printout is complete, otherwise printout cycle will be repeated. The minimum time for which the print request must be active is the picture update time-one second is usually sufficient, one scan of the user program will not be long enough to guarantee a reaction.

NOTE. Print requests in locations for areas 2-4 (-1 in L1-L3) will give screen printouts of individual screen areas, in case of video monitor 1. Set L5-L7, L9-L11, L13-15 to -1 for individual areas on video monitors 2, 3 & 4.

3.9 To print selected format definitions.

To obtain a printout of a format definition it is necessary to enter the video edit mode even though no alterations are to be made to the stored data. The format previously set in the L table will be displayed whilst in the video edit mode.

1. Connect printer to terminals on video termination panel. (Fig. 2.2 on page 4).
2. Choose format number for printout.
3. Connect programmer to video processor.
4. Select programmer option "EDIT/PRINT VIDEO FORMATS".
5. Enter selection number 7.
6. Reply with chosen format number when asked.
7. Reply "NO" when asked if you want to change format dimensions.
8. When screen displays "IN EDIT MODE NOW" press P\$\$ to initiate printout.
9. When printing complete press Q\$\$ to quit edit mode, and "Y" to confirm quit command.
10. Go to step 5 if you want to print another format. Otherwise reply "TERMINATE" to return to initial entry selection. (Selection number 1).
11. When finished, disconnect printer and programmer.

3.10 To merge two or more sets of formats

This procedure merges two or more sets of formats from different jobs. Note that this procedure requires more than one memory page.

Note also that format programs from old (unpaged) video systems are compatible with those from paged video, except that certain DRNs are not available.

1. Edit partition data to be the same in both sets.
2. Load set 1 into GEM 80.
3. Set up number of formats for each page which will be used with the procedure, so that all relevant format numbers are valid.
4. Copy into a different page, formats to be merged from set 1 (If both tapes have same page).
5. Clear page number used for loading, if both tapes have same page.
6. Load set 2 into GEM 80.
7. Now you can merge both sets according to requirements.
8. Check that each format displays correctly.

EXAMPLE.

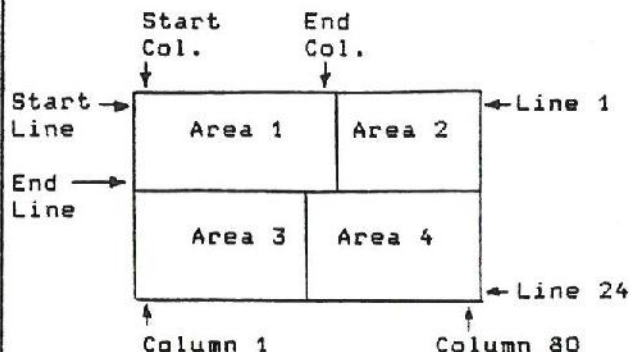
If set 1 contains 6 formats and set 2 contains 4, both dumped from page 0, then to collect set 1 and formats 3 & 4 from set 2 into page 3 proceed as follows:

- a) Edit partition data. (Assume use of one area only. Area 1 1 80 1 24).
- b) Load set 1 into GEM 80.
- c) Change number of format definitions in page 3 to a number ≥ 8 .
- d) Copy formats 1 to 76, 2 to 77, 3 to 78, 4 to 79, 5 to 80, 6 to 81. (Format 76 = format 1 of page 3).
- e) Clear page 0. (See section 3.6.7)
- f) Load set 2 into GEM 80.
- g) Copy formats 3 to 82, 4 to 83.
- h) Now we have in page 3 the result of merging sets 1 and 2, a total of 8 formats.

4. Video Programming

4.1 Partition Data

Fig 4.1 Positions of screen partition lines



The screen may be divided up into the layout shown above using the following rules:

- a) One horizontal partition line in any position between lines, or below last line.
- b) Two vertical partition lines in any position between columns, or to right of last column.
- c) End of one area must be cell adjacent to start of next area.
- d) Non-existent intermediate area must be specified as start column zero and valid data for end column and start/end row.
- e) Non-existent last area(s) can be specified as partition data all zero.
- f) Areas must exactly fill whole screen.

Table 4.2 Examples of Screen partitions.

		Start	End	Start	End
Area		Col.	Col.	Line	Line
Area 1		1	1	80	1
		2	0	0	0
		3	0	0	0
		4	0	0	0
Area 1	Area 2	1	1	50	1
		2	51	80	1
		3	0	0	0
		4	0	0	0
Area 1	Area 2	1	1	50	1
		2	51	80	1
		3	1	80	15
		4	0	0	0
Area 1	Area 3	1	1	80	1
		1	0	80	1
		3	1	50	15
		4	51	80	15
Area 1	Area 2	1	1	50	1
		2	51	80	1
		3	1	40	15
		4	41	80	15

NOTE. If inconsistent data present and response "NO" given to "DO YOU WANT TO CHANGE THIS?" then default data will be substituted automatically to give values in 1st example above.

4.2. NUMBER OF FORMATS

Range 1 to 25 for each page.

It is recommended that the number of formats on each page should correspond to the quantity programmed. This avoids possibility of strange looking pictures arising from a non-programmed format definition being requested.

Table 4.3. Correspondence between page and format numbers

Video page numbers range from 0 to 8, format numbers from 1 to 225. The correspondence between format numbers and video page numbers is:

PAGE No.	FORMAT Nos.	MEMORY MODULE
0	1 - 25	see note 2
1	26 - 50	)
2	51 - 75	) 1st additional
3	76 - 100	) 64K RAM
4	101 - 125	)
5	126 - 150	)
6	151 - 175	) 2nd additional
7	176 - 200	) 64K RAM
8	201 - 225	)

Note 1. It is necessary to specify a page number only when dumping formats to magnetic tape. When editing a format the page number is implied by the choice of format number

Note 2. 48K RAM on 225/235/245 etc., Data table/Instruction RAM on 250 series.

TABLE 4.4 Format requests.

Location in L table of host controller to be used for format requests:-

Video No 1		Video No 2	
Area 1 (L0)	Area 2 (L1)	Area 1 (L4)	Area 2 (L5)
Area 3 (L2)	Area 4 (L3)	Area 3 (L6)	Area 4 (L7)
Video No 3		Video No 4	
Area 1 (L8)	Area 2 (L9)	Area 1 (L12)	Area 2 (L13)
Area 3 (L10)	Area 4 (L11)	Area 3 (L14)	Area 4 (L15)

Video numbers 2, 3 & 4 are applicable only to GEM 80 controllers containing more than one video processor module.

4.3 Contents of L table locations.

axxxz, where x and z represent digits (0 to 9, A to F)

zz = 0, for dummy format (full screen of GEM 80s)

@1 to @E1 (decimal 1 to 225) for formats programmed by user.

@FF for screen print request.

xx = parameter byte.

0 when parameter facility not used.

@1 to @FF (decimal 1 to 127, -128 to -1) for parameter to be used for DRN address modification when invoked by V address modifier.

If parameter facility not used, decimal contents of L table location:-

0 = Dummy format (full screen of GEM80s)

1 to 225 = Format number as programmed by user

-1 = Screen print request.

Note that to obtain a printout of the whole screen the print request must be made in area 1.

4.4. Structure of format definition

A format definition may contain the following fields in any order:

a) Fixed text which will be displayed exactly as typed with the exceptions described in table 6.1. Characters available on portable programmer keyboard entered by pressing appropriate keys, using shift for lower case letters. Other characters (e.g. semigraphics) by using hexadecimal code including @ symbol and comma as delimiter e.g. @81,.

b) Fixed data instructions (see tables 4.5 & 4.6) which define fixed blocks of characters and attributes;

c) Variable data instructions (see tables 4.7 & 4.8) which define characters and attributes whose values depend on the contents of the host controllers' data tables;

d) Repeated data instructions which allow the fields above to be repeated any number of times without reprogramming (see table 4.9).

Optionally a special display definition for bar charts may be specified at the very beginning of a format (see table 4.10).

The end of a format is indicated by the character sequence ^E<cr> where ^<cr> indicates the carriage-return key. This end of format marker is automatically inserted when a format is created using option 5 from the editor menu.

It is recommended that a format definition includes a "whole area" attribute code instruction at the beginning of the format so that spaces appear as a single background colour and not as a random pattern of cells coloured by the attribute codes of the previously displayed picture.

4.5 Rules for Picture Build Up.

4.5.1. Position of Format.

Top left corner of picture specified in format definition appears in top left corner of requested format area.

4.5.2. Format Smaller Than Area.

Spaces automatically inserted to fill to end of each line, and lines of spaces inserted to fill to bottom of area.

4.5.3. Area Smaller Than Format.

If minimum format dimensions programmed with format definition are larger than requested area, format can occupy adjacent higher numbered area(s). Overlap by even one cell causes whole area to be occupied, and suppresses any format requested for that area.

If minimum size cannot fit, even allowing for occupation of adjacent areas, then requested format area (only) fills with ? symbols.

4.5.4. Request for Non-existent Format

If requested format number does not exist because the number of formats specified in the format data for that page is too small or the memory is not fitted, new request is ignored and the display in that screen area freezes. The update of the remaining screen areas continues normally.

If requested format number is within range of number of formats specified in format data, but has not yet been programmed, screen fills with spaces which have random pattern of colours according to the attribute codes of the previously displayed picture.

4.5.5. Positioning of characters/attributes on display

The picture is created using a pointer which defines the position where the next character/attribute is to be placed. The pointer is moved according to the following rules:

- a) Fixed or variable data instructions generating attribute codes do not move the pointer, neither does the upward fixed character instruction;
- b) Fixed text characters move the pointer one position to the right for each character except for the control

characters detailed in table 6.1

c) DRN fields generating characters leave the pointer one character to right of the last character position affected. The exceptions to this are vertical bar charts where the pointer is moved one position to the right on the same line.

4.5.6. Line Longer Than Area Width.

There is no restriction on the line length which can be programmed in a format definition. When displayed, a long line will be subdivided to fill the area width as often as necessary.

The extra picture lines so generated cause subsequent lines to move down, and may cause the last line(s) to disappear.

If a DRN field overlaps the end of a line in a format area, the DRN field is filled with ? symbols to the end of the line, and the remainder of that line in the format definition is ignored.

4.5.7. More Lines Than Area Depth.

If display would occupy more lines than available in occupied area(s), excess lines in format definition area ignored i.e. do not appear.

4.5.8. Conflicting Instructions.

The format definition is executed in the order in which the program is stored. If more than one instruction affects the character or attribute code of a cell then the last instruction determines the displayed picture

Typically a whole area attribute instruction at the beginning of a format definition will be overridden in particular areas where a different colour is required. Note that variable data (called by DRNs) always overwrites fixed data (called by fixed data instructions).

TABLE 4.5
Form of fixed data instructions

^^Type,@Code,Width^

- ^^ - Delimiter marking start of instruction
Type - Instruction type number (table 4.6). Invalid outside range 1 to 4, 12 to 13
@Code - Hexadecimal code for characters or attributes
Width - Field width as unsigned decimal integer >= 1
^ - Delimiter marking end of instruction

NOTES.

1. Order MUST be maintained as shown.
2. No extra characters (e.g. spaces) permitted.
3. Every field must be followed by a delimiter; commas at intermediate points, or ^ at end of instruction.

EXAMPLES.

^^1,@6,1^ - Fill area with attribute code @6 i.e. yellow on black background.

^^12,@08,10^ - Fill 10 cells to right with characters @08 i.e. horizontal pipe.

TABLE 4.6 Set of fixed data instructions

TYPE - Description

- 1 - Sets ATTRIBUTE code for whole format area. Uses dummy field width (e.g.1)
2 - Sets ATTRIBUTE code for n cells to right.
3 - Sets ATTRIBUTE code for n cells upwards.
4 - Sets ATTRIBUTE code for n cells downwards.
12- Sets CHARACTER code for n cells to right.
13- Sets CHARACTER code for n cells upwards.

NOTE.

Types 12 and 13 may be used with unity field width to obtain display of characters reserved for control purposes such as "2" and "3".
Field width for type 2,3,4,12,13 specifies no. of cells. ("n")

TABLE 4.7 Form of variable data instructions (DRNs)

^CWIDTH,ICTYPE,ICADDRESS,IC(V)(+N),(N),(*N),(a)^ ((*N) can be replaced by (/N))

SYMBOL - Description

- ^ - Delimiter marking start and end of DRN
[] - Denotes mandatory item (Don't type)
() - Denotes optional item (brackets).

WIDTH-Field width as unsigned decimal integer in range 1 to 80

TYPE -DRN type number (table 4.8). Invalid outside range 1 to 58.

ADDRESS-Data table location reference of externally accessible tables of host controller (private tables not accessible typically F & R)

V -Letter "V" invokes use of address modifier (set by DRN5 or DRN19) to offset table location. If DRN5 is used to set modifier, and parameter byte in L table is zero, then address is offset by adding address modifier multiplied by (video number minus one). If DRN5 is used with non-zero parameter byte, then it behaves as DRN19. If DRN19 is used to set modifier, then address is modified by adding address modifier multiplied by parameter byte in L table.

+N -Incremental offset for table location when used within a "repeat". Range -127 to 127. Negative increments entered as "+-N".

.N -Point selector to utilise data from single ON/OFF state in table location. Range .0 to .15

*N,/N-Scaling factor for contents of data table. N in range +-32767. * to multiply, / to divide. Result limited at +-32767 and truncated to form integer.

a -Additional data for conditional attribute DRNs 21-24, 34-37. Form is A@code1,N,@code2 where "code" is attribute code (table 6.3) and "N" is decimal integer in range +-32767 for comparison with data table contents.

NOTES.

1. Order MUST be maintained as shown.
2. Brackets [] () are for explanation purposes only; they are not part of DRN code.

3. No extra characters (e.g. spaces) permitted.

4. Every number must be followed by a delimiter; commas at intermediate points, or ^ at end of DRN.

5. Data which has been stored by a GEM80 logging video (see separate product publications) can be displayed by a paged video using DRNs. Special interpretations are placed on the bit and address fields of the DRN definition as follows :-

ADDRESS - Table letter is always 'V'. Location is sample offset from most recent; e.g. V0 displays most recent sample, V1 the previous etc.

.N - N defines channel number from which data will be taken.

The address modifier may be used with logging and has the effect of changing offset of the data being displayed (which always comes from the same channel). To vary the logging channel number DRN18 may be used to set an offset from the channel specified. The offset is the contents of the data table specified in DRN18. (See example below)

EXAMPLES.

^6,2,G120^ - Decimal display of contents of G120.

^12,13,G120,/16^ - Bar chart display, contents of G120 divided by 16.

^6,2,G120,+10^ - When included within "repeat" displays contents of G120,G130,etc..

^10,35,G12,.15,Aa4,1,a6^ - Switches attributes of 10 cells to right from a6 (yellow) to a4 (red) when G12.15 ON.

^1,18,G1^a6,2,V0,.1^ - Decimal display of latest sample from logging channel n+1, where G1 contains n.

TABLE 4.8 Set of variable data instructions(DRNs)

TYPE - DESCRIPTION

1. Displays data table contents as 4 hexadecimal digits, including any leading zeroes. Display range 0000 to FFFF. Field width should be 4, otherwise display will be misplaced.
2. Displays data table contents as signed decimal integer with any leading zeroes suppressed. Display range +-32767. Field width 1 for numbers restricted to range 0 to 9; otherwise first space in field reserved for sign displayed only when negative. If quantity of digits plus sign exceeds field width, "?" is substituted for digit furthest to right. Field width >= 6 for full number range. Table contents a8000(-32768) displayed as all spaces. See note A.
3. Displays table contents as characters from display character set. Field width 1 or 2 to choose single character (low order byte) or pair of characters (low order byte to left). DRN invalid if field not 1 or 2. (Rest of display full of "78").
4. Displays message string starting at internal address given by contents of data table. Field width in DRN code is dummy (e.g. 1). See notes B,C,G,H.
5. Sets address modifier so that subsequent DRN addresses can be modified by invoking V modifier. Numerical part of dummy table address included with DRN5 defines modifier. Table letter must be included, but is not used e.g. G100 for modifier = 100. If parameter byte is zero, and subsequent DRN includes "V" in DRN code, then address is modified by adding modifier times (video number minus one).
Example:-
^1,5,G20^ ^6,2,G50,V^
DRN5 sets modifier to 20.
DRN2 displays contents of G50 on video processor number 1, G70 on video 2, G90 on video 3, etc.
If parameter byte is non-zero, then DRN5 behaves as DRN19.
6. Sets characters flashing if data table contents non zero. Choice of field width 1 to 80 to specify quantity of affected cells horizontally to right. See note D,E.
7. Sets characters reverse video if data table contents non-zero. Choice of field width 1 to 80 to specify quantity of affected cells horizontally to right. See notes D,E.

8. Display message string which starts at given data table location. Field width in DRN code is dummy (e.g. 1). See note G.
9. Display data table contents as large (3x3 cells per digit) signed decimal integer with any leading zeroes suppressed. Display range +-32767. Field width relates to quantity of large characters not number of cells. Field width 1 for numbers restricted to range 0 to 9.; otherwise first space in field reserved for sign displayed only when negative. Field width >=6 for full number range. Table contents 38000 (-32768) displayed as all spaces. Position of DRN code determines position of bottom left hand corner of display field. See notes A,I.
10. Display data table contents as single width, unsigned decimal integer with leading zeroes. Display range 0 to 32767. Field width >=5 for full number range. See notes I,J,R.
11. Display data table contents as single width, unsigned decimal integer with leading spaces. Display range 0 to 32767. Field width >=5 for full number range. See notes I,J,R.
12. Does not exist i.e. invalid DRN.
13. Vertical bar, 1/12 cell resolution. Low byte of data (after optional scaling) sets distance upward to top of bar, high byte sets distance upwards to bottom of bar. Choice of field width 1 to 24 to specify maximum height of bar in cells. (Only 1 to 22 usable, since maximum height is 21.25 cells in length). Each byte is treated as positive integer in range 0 to 255 setting distance in 1/12 cell increments, automatically limited at maximum bar length. If both high and low bytes are used simultaneously then bar less than one cell in length may disappear, because the character set does not include symbols for very short bars in mid-cell. See notes A,E,F.
14. Horizontal bar 1/3 cell high (top) 1/2 cell length resolution. See notes A,E,K.
15. Horizontal bar 1/3 cell high (middle) 1/2 cell length resolution. See notes A,E,K.
16. Horizontal bar 1/3 cell high (bottom) 1/2 cell length resolution. See notes A,E,K.
17. Horizontal bar 1 cell high 1/2 cell length resolution. See notes A,E,K.
18. Sets logging channel modifier to contents of specified data table location for video number 1, location + 1 for video 2, location + 2 for video 3, and location + 3 for video 4. Width is dummy.
19. Sets address modifier so that subsequent DRN addresses can be modified by invoking V modifier. Numerical part of dummy table reference included with DRN19 defines modifier. Table letter must be included, but is not used e.g. G100 for modifier = 100. Address is modified by adding modifier times parameter byte.
Example:-
LD = 30107 i.e. parameter = 1
^1,19,G20^ ^6,2,G50,V^
DRN19 sets modifier to 20.
DRN2 displays contents of G70 (G50 offset by 20 x 1).
20. Does not exist i.e. invalid DRN.
21. Switches attribute codes for whole format area. See notes D,L.
22. Switches attribute codes for n cells to right. See notes D,E,L.
23. Switches attribute codes for n cells upwards. See notes D,E,L.
24. Switches attribute codes for n cells downward. See notes D,E,L.
25. Sets up attribute code for whole format area. Address will determine attribute. It can be used instead of fixed characters and attribute type 1, to make attribute dynamic. See note M.
26. Sets up attribute code for n cells to right. See notes E,M.
27. Sets up attribute code for n cells upwards. See notes E,M.
28. Sets up attribute code for n cells downwards. See notes E,M.
29. Signed decimal output with leading zeroes suppressed. 5 decimal places. Range +-0.32767 - See notes A,I,N,R.
30. 4 decimal places. Range +-3.2767 - See notes A,I,N,R.
31. 3 decimal places. Range +-32.767 - See notes A,I,N,R.
32. 2 decimal places. Range +-327.67 - See notes A,I,N,R.
33. 1 decimal place. Range +-3276.7 - See notes A,I,N,R.
34. Switches attribute codes for whole screen. See notes D,P.

35. Switches attribute codes for n cells to right. See notes D,E,P.
36. Switches attribute codes for n cells upwards. See notes D,E,P.
37. Switches attribute codes for n cells downwards. See notes D,E,P.
38. Display data table contents as DOUBLE width signed decimal integer with any leading zeroes suppressed. Display range +-32767. See notes I,Q,R.
39. Display data table contents as DOUBLE width unsigned decimal integer with leading zeroes. Display range 0 to 32767. See notes I,J,Q,R.
40. Display data table contents as DOUBLE width unsigned decimal integer with leading spaces. Display range 0 to 32767. See notes I,J,Q,R.
41. 5 decimal places. DOUBLE width. See notes I,N,Q,R.
42. 4 decimal places. DOUBLE width. See notes I,N,Q,R.
43. 3 decimal places. DOUBLE width. See notes I,N,Q,R.
44. 2 decimal places. DOUBLE width. See notes I,N,Q,R.
45. 1 decimal place. DOUBLE width. See notes I,N,Q,R.
46. Sets starting address for indexed message list to data table location specified in DRN. Use in conjunction with DRN 47. Width is dummy.
47. Indexed message output. Data table contents is number of message to be displayed, using list set by DRN46. See notes G,S,T.
EXAMPLE:-
Set P300=04805, P301=0544F,
P302=0000A, P303=04305, P304=04C4F,
P305=00A44.
P300 forward hold 2 strings of 5 characters each.
We want to display second string which starts at P303. Call format with:
^1,46,P300^^1,47,G11^, where G11 has been set to 2.
-<AND>-----<OUT>--
2 G11
48. Sets starting address for indexed message list to contents of data table location specified in DRN. Use in conjunction with DRN 49. Width is dummy. With a GEM80/250 series controller, specifying table X0 in DRN will enable the system printer message list to be used.

49. Indexed message output. Data is number of message to be displayed, using list set by DRN48. See notes G,S,T.
EXAMPLE:-
Set P table as for DRN 47. Using ladder diagram set G10=absolute address of P300.

LOCATE
-<AND>----SPEC----VALUE---<OUT>--
0 S20 P300 G10
Now calling format with :
^1,48,G10^^1,49,G11^, will result in the same display as previous example.

50.) Invalid.
51.) DRNs.
52. Display data table contents as large (3x3 cells per digit) unsigned decimal integer with leading zeroes. Display range 0 to 32767. If quantity of digits > width, "?" will be displayed instead of the number. See notes I,J,R.
53. Display data table contents as large (3x3 cells per digit) unsigned decimal integer with leading spaces. Display range 0 to 32767. If quantity of digits > width, "?" will be displayed instead of the number. See note J.
54. 5 decimal places. TRIPLE high. See notes E,I.
55. 4 decimal places. TRIPLE high. See notes E,I.
56. 3 decimal places. TRIPLE high. See notes E,I.
57. 2 decimal places. TRIPLE high. See note E,I.
58. 1 decimal place. TRIPLE high. See notes E,I.

NOTES:-

A. Data table contents optionally scaled by multiplication or division by factor in range +-32767. Result limited at +-32767 or truncated to form integer.

B. LOCATE special function S20 may be used in host controller to obtain internal address of table location. See software Data Sheet S20.

C. Message string can include (hex code for) any character from display character set.

D. Optionally switching can be determined by individual ON/OFF state within table location.

E. Field width invalid if field would overlap edge of format area.

F. Downwards going bar charts can be achieved by controlling the values of both low and high bytes.

The following examples use parameter in location G10 to vary the bar length, using DRN13 with address G20 and field width 12 cells (144 units).

Set W101=0 and W102=255

Upwards going bar for positive parameter may be achieved by limiting parameter to range 0 to 255 and copying to DRN address. This has the effect of setting low byte to bar length and high byte to zero.

LIMIT

```
I-<AND>---SPEC---VALUE-----<OUT>--I
  G10   S32   W100         G20
```

Downwards going bar for negative parameter may be achieved by setting low byte to maximum bar length and high byte to (field width in units+parameter), limited to range 0 to 255.

LIMIT

```
I-<AND>---<ADD>---SPEC---VALUE---<OUT>-I
  G10   144   S32   W100   G11
```

```
I-<AND>-----+-----<OUT>-I
  144           I           G20
```

SWAP I

```
I-<AND>---SPEC---+
  G11     S4
```

Bidirectional (centre zero) bar for parameter which is positive and negative going may be achieved by using the sign of the parameter to manipulate the data. For positive parameter, the low byte is set to (parameter+1/2 field width in units), and high byte to (1/2 field width in units). For negative parameter the low byte is set to (1/2 field width in units), and high byte to (parameter+1/2 field width in units). In both cases, range is limited to 0 to 255.

LIMIT

```
I-<AND>---<ADD>---SPEC---VALUE---<OUT>-I
  G10   72   S32   W100   G11
```

```
I-<AND>---<OR>---] / [-----+-----<OUT>-I
  G11  24800  G10.15   I   G20
```

SWAP I

```
I-<AND>---SPEC---<OR>---] [---+
  G11   S4   248   G10.15
```

G. WRTTEXT, PRITEXT, CHARIN and PRINT special functions utilise the same techniques for storing text strings in data tables. See Software Data Sheets for string layout and programming aids. 1st byte of message string is message length, hex code for quantity of characters; subsequent bytes are hex code for characters.

I. If quantity of digits plus sign exceeds field width, "?" is substituted for digit furthest to the right.

J. Suitable only for positive numbers. Attempt to display negative numbers will result in incorrect data.

K. Field extends to right of position of DRN. Low byte of data (after optional scaling) sets distance to right hand end of bar, high byte of data sets distance to left hand end of bar. Each byte is treated as positive integer in range 0 to 255 setting distance to right in 1/2 cell increments, automatically limited at maximum bar length. Choice of field width 1 to 80 to specify maximum bar length in cells. Left going, right going, and bidirectional bars may be achieved in a similar manner to that described in note F for vertical bars.

L. DRN code has additional data of form :

A@code1,N,@code2.

Attributes are code 1 if data table contents >= N otherwise code 2. Choice of field width (positive only) to specify number of cells "n". Field width is dummy (e.g. 1) for whole area DRN.

M. Attribute code to be used is contained in data table. Choice of field width (positive only) to specify number of cells "n". Field width is dummy (e.g. 1) for whole area DRN.

N. This DRN takes integer contents of data table and inserts decimal point to give display of signed decimal number. Leading zeroes suppressed except immediately preceding decimal point. 1st space in field width reserved for sign displayed only when negative.

P. This DRN has additional data of the form :

A@code1,N,@code2.

Attributes are code 1 if data table contents = N otherwise code 2. Choice of field width (positive only) to specify number of cells "n". Field width is dummy (e.g. 1) for setting whole screen.

Q. This DRN requires the "double width" facility to have been switched on somewhere in the preceding part of the line, by the inclusion of character "21E,". If this character is omitted then the DRN will display pairs of single width characters.

R. Field width >= 7 for full number range (>7 for DRNs 29 and 41 to allow for zero before decimal point). Table contents 28000 (-32767) displayed as all spaces.

S. Two separate bases can be set up using DRN's 46 and 48 and may be used repeatedly by DRN's 47 and 49 without interference.

T. With a GEM80/250 controller message indexing starts at 0, while on other controllers it commences at 1.

TABLE 4.9 Form of repeats

Repeat facility to increment through a table words or bits at a time.

^RN,(CR)[Instructions]@0,
OR
^rN,(CR)[Instructions]@0,

Symbol : Description

^R : Code for WORD repeat command.

^r : Code for BIT repeat command.

N, : Number of repetitions. N is unsigned decimal integer.

(CR) : Carriage return key depressed to mark next character as start of that which is to be repeated. Does not introduce new line in format definition.

[Instructions] : Any chosen sequence of text, fixed data instructions, and variable data instructions (DRNs). Uses "+N" option of DRNs to obtain different variable data for each repeat. Include (CR) if each repeat to be on a new line. Don't type brackets. Include starting bit for bit repeat.

@0, : Delimiter marking end of repeat.
N.B. Nesting not allowed.

EXAMPLES:-

1. Horizontal word repeat

^R4,(CR)
^4,13,G10,+1^ @0,(CR)

This produces 4 bars with bar lengths taken from G10,G11,G12,G13.

The spaces within the repeat give the desired spacing.

2. Horizontal bit repeat

^r10,(CR)
^8,2,G10,+2,.0^ @0,
G10 = Starting location
+2 = increment size
.0 = starting bit

This display data from G10.0, G10.2, G10.4 ... G11.0, G11.2 as a row of 0's and 1's separated by spaces.

3. Vertical repeat

R3,(CR) ^6,2,G1,+1^ ^6,33,G21,+1^ (CR)
@0,

This produces 3 lines PALLET WEIGHT with pallet no. taken No. Kg.

from G1,G2,G3 and

weight taken from

G21,G22,G23

510 103.0
511 112.7
512 109.3

Initial pointer position

TABLE 4.10 Fast response bar charts

If format definition utilizes the facility for fast response bar charts, the following codes must be at the very beginning of the format definition:-

% Width, Gap, No of bars, Axis, Origin, Height, Depth, (CR)
1,[@Code1, Address1, @Code2, Address2, @Code-1, Address-1, @Code-2, Address-2, @Code3, @Code-3, Variable, Multiplier, Offset](CR)
2,[Data as above for 2nd bar](CR)

1 " " " " " " " "
1 " " " " " " " "
n,[" " " " nth "](CR)
%

Symbol : Description

% : If first character in format definition, delimiter for fast response bar chart definition.
(CR) : Carriage return key on programmer.
Width : Double width switch
: 0 for bars 1 cell wide
: 1 for bars 2 cells wide
Gap : Gap switch
: 0 for no gaps
: 1 for gap between bars
No of bars : Number of bars
: (1 to 80)
Axis : Line number of x axis
: (2 to 24)
Origin : Column number of
: origin (1 to 80)
Height : Max height in cells of
: upwards going bars
Depth : Max depth in cells of
: downwards going bars
1...n : Bar number included solely
: as programming aid. No
: effect on display.
[] : Square brackets INCLUDED IN
: CODE as delimiters for
: data for each bar.
@Code1, : Attribute codes Regions
@Code2, : for each region
@Code3, : of bars
@Code-1, : (Code1=1st region
@Code-2, : Code2=2nd region
@Code-3, : etc.)
Address1 : Data table locations
Address2 : containing (positive)
: decimal integer
Address-1 : defining number of cells
: from axis to extremity
Address-2 : of each region.
Variable : Data table defining
: height of bar
Multiplier : Scaling factor for
: variable.
: -128 for scaling by +1.
: Otherwise M in range +-127
: to scale by M/128

3
2
1
-1
-2
-3

Offset : Factor to offset scaled
: variable.
: 0 for no offset; otherwise
: range +-127.
Length of bar in 1/12 cell increments =
data table value x multiplier +offset
128

EXAMPLE:-

Set P90=1, P92=3, P94=5, P95=6, P96=7, and ladder diagram to:-

```

-<AND>-----<OUT>-
-150                                     G9
-<AND>---<ADD>---J/C-----<OUT>-
G9      G5      G5.8                  G4
-<AND>---<ADD>---J/C-----<OUT>-
G5      1      G5.8                  G5

```

Display 2 bars, double width, gap, origin in the middle of screen.

The actual format is :

```

%1,1,2,12,40,11,7,
1,[6,P90,4,P95,2,P92,7,P96,7,7,G4,-128,
30]
2,[8E,P93,89,P95,8A,P92,7,P96,7,7,G4,
-128,30]
%
^^1,88,1^^E

```

The two bars have been defined similarly, but some attributes are different to show some of the effects it is possible to achieve with fast response bar charts.

NOTES:

1. For width, gap, no of bars, axis, origin, height, depth; each quantity entered as decimal integer followed by comma (negative numbers invalid).

2. If remainder of format definition contains DRNs they will be regarded as fixed data updated only:-

a) When format 1st requested by changing L table contents

b) If format requested with "parameter" byte 8FF

The same conditions are required for evaluation of all the background data for the bar chart; normally the "variable" is the ONLY data to be updated on each scan, thus achieving fastest possible response.

3. If data for particular bar is of invalid form then dummy data is substituted by editor on EXIT command. The data entered by the user between the square bracket is discarded and the following data substituted:-

8C4 (reverse video flashing red) for each attribute code, P0 for each address associated with attributes, C31 for variable, one for multiplier, zero for offset.

4. Character IMMEDIATELY following final % is equivalent to the beginning of a normal format definition i.e. pointer is at top left corner of area.

Don't type (CR) unless top line of background data is to be blank.

4.6 Format definition program size

Maximum allowable size of format definition varies according to the screen area which is to be occupied.

Max size = (Area x 2.0) + 165
(bytes) (cells)

Max size increases if requested format occupies adjacent area to right on screen, or occupies whole screen, but does NOT increase if areas 1 or 2 overflow into areas 3 or 4 respectively.
2 bytes = 1 P-table location.

4.7 Program size minimization

1. Maximise use of multi-cell character set up codes, and repeat facilities.
2. Use "tab" facility in preference to multiple spaces for positioning elements of display.
3. As a last resort, store text messages in P table of host controller instead of as fixed format data.

TABLE 4.11 Estimation of program size

Item	Bytes
Directly entered characters) e.g. ABab(CR)?(space))	1 per character
Characters entered as hex code e.g. 2CD,)	character
End of format : ^E(CR)	3
Minimum DRN ^Width,Type, Address^	7
DRN options:- V	1
+N	2
.N	2
*N or /N	3
A@code1,N,@code2	5
Fixed data instruction ^^Type, @code, Width^	6
Fast response bar chart	8+23 per bar

5. Format Editor

The GEM80 Format Editor allows the user to create and update video format definitions. The editor can be used to manipulate text and DRN's on a line or character basis. The editor contains a pointer into the format definition and this pointer is always located between two characters rather than at a character. On initial entry and after 'View' the pointer is positioned at the start of the format.

Facilities are provided to insert/delete characters, delete lines, search for blocks of text, substitute blocks of text with others and print out the current format definition. Commands are also available to move the editing pointer within the format without altering the contents.

In general each of the editor commands may be executed multiple times by specifying an iteration count prior to the command. Editor commands may also be entered and executed as a block rather than executing each command singly.

When the editor is ready to accept a new command it will output a prompt ('>') at the left-hand margin. If the cursor is at the left-hand margin and the prompt is not displayed one of two conditions exists; either a text string is being entered or the editor is busy processing a previous command. To correct a typing error the RUBOUT key can be used to remove previously typed characters.

TABLE 5.1 Entry of editor commands

Requirements	General format
Execute single command	[CMD]\$\$
Execute command n times (backwards direction if n negative)	n[CMD]\$\$
Execute string of commands in sequence	(n)[CMD](n)[CMD]... ...(n)[CMD]\$\$

[CMD] - Command code as defined in TABLE 5.2.

\$ - "escape" key, pressed once to delimit text string, twice to initiate execution.

n - integer, positive by implication
negative if "minus" sign included.

() - optional item (don't type brackets).

TABLE 5.2 Set of editor commands

Command Code	Description
B	- Move pointer to beginning of format definition.
(n)C	- Move pointer 1 (or n) characters from current position. Minus to move backwards. See notes 2,3
(n)D	- Delete 1 (or n) characters starting from current pointer position. Minus to delete preceding characters. See notes 2,3
E	- Exit from edit mode, modify any DRNs found to be invalid, and store new format definition instead of previously stored format. See note 4
(n)Ftext\$	- Find specified string 'text' (n times), starting from current pointer position and moving pointer to end of (nth) string. Limit of 20 characters in string; "n" must be positive. See notes 1,5,6
(n)Itext\$	- Insert specified string 'text' (n times), starting from current pointer position, and finishing with pointer at end of (nth) insert. "n" must be positive. See notes 5,7,10
(n)K	- Kill 1 (or n) lines, starting from current pointer position. See notes 3,8,9
(n)L	- Move pointer to beginning of next (or nth) line, relative to current pointer position. OL for current line. See notes 3,8
M	- Display on programmer screen quantity of free memory available on video processor for edit purposes.
N	- Store edited version of first part and start edit of next part of format definition which has automatically been split into 2 parts, for edit purposes (programmer displays "edit in 2 parts"). See note 4
P	- Print format definition currently held by video editor. Does not use or move pointer. Prints one part at a time when editing in 2 parts.
Q	- Quit edit mode WITHOUT storing new format definition. i.e. leaving unaltered the previously stored format.

NOTE : Previously stored format will already have been altered if VIEW command has been used, or NEXT has been executed in a 2 part edit.

(n)Soldtext\$newtext\$ - Substitute the string 'oldtext' with the string 'newtext' (n times) starting from current pointer position and finishing with pointer at end of (nth) substitution. If 'newtext' is a null string this has the effect of deleting 'oldstring' (n times). See notes 1,5,6,7,10.

(n)T - Type (display on programmer screen) 1 (or n) line(s), starting from current pointer position. Does not move pointer.
OT for current line as far as pointer. See notes 3,8

V - View command updates the video display. It is equivalent to exiting, displaying format and then immediately re-entering edit mode for the same format definition. Pointer moves to beginning of format definition.

Z - Move pointer to end of format definition. See note 11

NOTES:-

- 1.- String length to be found or substituted is limited to 20 characters.
- 2.- Repeated character commands can run from line to line; carriage return (marking end of line) counts as one character.
- 3.- If repeated command cannot be executed n times, it will be executed as many times as is possible, finishing when end of format definition is encountered.
- 4.- None of the format definition is stored in video memory modules until "Exit", "Next", or "View" command executed. If DRN found to be invalid, extra text "INVALID DRN" is automatically inserted, and DRN treated as text string for display. Should the memory page containing the format being edited not have sufficient space to store the new definition the user will be offered the choice of aborting the edit (same as "Quit") or proceeding with the edit to make the format definition smaller.
- 5.- Text strings can include spaces, carriage returns, DRNs etc..
- 6.- If "n" exact matches cannot be found, edit will execute as many as possible and then abort string of commands with message "CANNOT FIND STRING:-...".
- 7.- If insufficient memory available on video processor, editor will execute as many complete strings insertions as possible and then abort string of commands with message "INSUFFICIENT MEMORY SPACE".
- 8.- A "line" is defined by the inclusion of a carriage return (or line feed) character in the format

definition. Extra lines generated automatically on the programmer screen by exceeding the screen width do not count as new lines in the format definition.

9.- When killing a positive number of lines, characters following pointer in current line count as 1st line. When killing a negative number of lines, the previous line counts as the first line. OK (or-nK) deletes characters preceding pointer in line containing pointer.

10.- If less than 196 bytes available for video editor more space can be created by commanding exit and re-entering edit mode.

11.- Last 3 characters in format definition MUST be ^E(CR). Use Z-3CI... to make an insertion at the end.

6. CHARACTER SETS

TABLE 6.1 Control characters

Code	Function when included in format definition	Display if included in text string called by DRN
@0	Delimiter marking end of repeat; no display	Space except in DRNs 47&49 when ignored.
@9	Tab. Inserts spaces on display as far as next cell with column no. divisible by ten.	Vertical bar symbol. 1/2 cell high, 1 cell wide
@A	Combined carriage return and line feed. Generated by video system from CR or LF keys on portable programmer.	Vertical bar symbol. 7/12 cell high, 1 cell wide
@D	Ignored; no effect on display.	Vertical bar symbol. 11/12 cell high, 1 cell wide
@1C	2nd character set on	If double set provided
@1D	1st character set on	
@1E	Switches on double width character facility. Produces single space on screen with subsequent characters double width, read from odd numbered columns of format definition, skipping alternate characters. Double width is automatically switched off at the end of each line of picture, but runs over from one format area to the next. User is advised to enter each double width character as identical pairs in format definition.	
@1F	Switches off double width character facility. Produces single space on screen. User is advised to precede @1F by at least one space so that change cannot occur in mid-symbol.	
@40	@ Symbol not usable in text. Reserved to indicate hex code	@
@5E	^ symbol not usable in text. Reserved as delimiter.	^
@7F	Reserved for internal use to delimit DRNs. Must not be included in format definition.	Space

TABLE 6.2 Elements of attribute codes

Bit No.	Attribute
0- BLUE	Foreground colour
1- GREEN	i.e.colour of character
2- RED	ON to select colour
3- BLUE	Background colour
4- GREEN	i.e.colour of rest of cell
5- RED	ON to select colour
6- FLASH	ON to flash at 0.78Hz, 50% mark space ratio
7- REVERSE VIDEO	ON to interchange foreground and background colours

NOTE:- Combined flashing and reverse video is a particularly eye catching display. The reverse video characters alternate with cells full of background colour.

TABLE 6.3 Attribute codes

		Background colour							
FOREGROUND COLOUR		Bk	Bl	Gn	LB	Rd	Pp	Ye	Wh
Bk BLACK		00	08	010	018	020	028	030	038
Bl Dk BLUE		01	09	011	019	021	029	031	039
Gn GREEN		02	0A	012	01A	022	02A	032	03A
LB Li BLUE		03	0B	013	01B	023	02B	033	03B
Rd RED		04	0C	014	01C	024	02C	034	03C
Pp PURPLE		05	0D	015	01D	025	02D	035	03D
Ye YELLOW		06	0E	016	01E	026	02E	036	03E
Wh WHITE		07	0F	017	01F	027	02F	037	03F

Add:

040 for FLASHING

080 for REVERSE VIDEO

Examples:

Red on black = 04
 Yellow on green = 016
 Flashing yellow on red 040+026 = 066
 Reverse black on yellow 080+038 = 0BB
 Flashing reverse red on black 080+040+04 = 0C4

7. Diagnostics

7.1 Video system self test

7.1.1. POWER UP TESTS

a) System initially displays random picture.

b) Checks contents of video processor executive program by computing CRC for EPROM contents and comparing with CRC stored in 1st EPROM. (Checks set of EPROMS on 8603 sub-module)

c) Tests working memory on 8603 sub-module by writing and reading back patterns 05A and 0A5 in every memory location.

d) If a and b satisfactory, fills screen with yellow zeroes on black background. If not, leaves random pattern on screen and ceases all activity (i.e. will not communicate with programmer).

e) After a few seconds delay, fills screen with format zero (columns of GEM 80 in all possible colours), and begins normal operating cycle, reading L table of host controller and assembling requested picture.

7.1.2. REGULAR ON-LINE TEST

On each new format request, checks for memory response while copying format definition from video memory module. If no reply (bus timeout) does nothing (keeps displaying but not updating last requested format), and continues to operate normally for other format areas and other format requests.

7.1.3. MEMORY TEST INITIATED BY USER.

Active write/read testing of external memory is possible only while the portable programmer is connected, because only then is the video processor write enabled.

It is recommended that the user should perform an external memory test during system commissioning and subsequently if malfunction is suspected.

The test can be performed at any time without affecting stored video programs, but the need to enter the video edit mode means that the video display cannot be updated during testing.

The test is performed by entering the edit mode, selecting option 0 and entering the desired page number (0 to 8). The system then performs an automatic write/read to every byte in that 16Kbyte page, preserving the previous memory contents.

7.2 FAULT DIAGNOSIS

SYMPTOM	POSSIBLE CAUSES	RECOVERY PROC.
Random picture appears and remains	EPROM, RAM or processor fault on Video processor module	Substitute spare video processor module 8204 and 8603 as a pair
Fault detected by user initiated external memory test	Missing memory module	Refer to user information for host controller to establish position of suspect module. Page 0 is on same module as control program Pages 1 to 4 and 5 to 8 on 1st and 2nd memory module respectively.
	Faulty memory module	Substitute spare for appropriate module and repeat memory test. If successful use initial selection option 7 to clear all pages on new memory module.
	Addressing fault on video processor	If unsuccessful try substituting spare video processor.
Picture freezes full of GEM80s	Invalid format request in host controller	Check L table contents > 0 and is valid for the quantity of formats specified in format data for that page. Also check if set for correct type of host.
Format area fills with red ? on black background	Requested format occupies too much working memory for size of area chosen	(a) Request format in larger area or (b) Adjust partition data or min. format size or (c) Simplify format definition
Line in format area fills to end with ?	Item of variable data overflows line end	(a) Request format in larger area or (b) Edit position or field width of DRN in definition

Text "INVALID DRN-" appears after edit operations	Field width outside range 1 to 80 ----- DRN type outside range 1 to 58 ----- Data table letter E, F or R used on other than 250 series ----- Incorrect structure of DRN code, e.g. wrong order, missing or displaced fields	Edit format definition, delete text INVALID DRN- (12 characters including space, dash) and rectify error
Rows of 72 to end of area	No end delimiter in DRN code	Find missing or displaced and edit to rectify
Rows of 73 to end of area	Attempt to use invalid DRN type ----- Program loaded from magnetic tape containing invalid DRN type outside range 1 to 58	Edit and rectify DRN code ----- Edit and rectify DRN code
Rows of 74 to end of area	Attempt to access invalid logging channel.	Edit format or change number of logging channels. Also check data contents if DRN18 invoked
Rows of 75 to end of area	Invalid definition for fast response bar charts; bars would go outside horizontal limit	(a) Adjust partition data or min. format size or (b) Reduce number, width or space between bars or (c) Adjust origin position
Rows of 76 to end of area	Invalid definition for fast response bar charts; bars would go outside vertical limits	(a) Adjust partition data or min. format size or (b) Reduce height or depth of bars or (c) Adjust axis position

Rows of 77 to end of area	Invalid DRN code for bar charts; bars would go outside area	(a)Adjust par- tition data or min. format size or (b)Reduce field width of DRN or (c)Adjust DRN position
------------------------------------	--	--

Rows of 78 to end of area	DRN code with invalid field width	Edit field width or posi- tion of DRN
------------------------------------	---	---

Display of a number ends in ?	Field width of DRN too small for no. to be displayed	(a)Increase field width of DRN or (b)Limit size of no. in host controller data table
---	---	--

"INSUFFI
CIENT
MEMORY"

message on exit command or "LINK FAIL"	Video processor not write enabled	Check GEM 80 of programmer lead has pins 13,14 linked
--	---	--

message on tape load	Memory full	(a)Transfer format defini- tion(s) to o- ther page(s). (b)Simplify format defini- tions to redu- ce size of program
----------------------------	-------------	---

"INSUFFI CIENT MEMORY" message on edit command e.g.in- sert or substi- tute	On-board video memory full	Exit and re- enter edit mode. Video will automati- cally adopt "EDIT IN 2 PARTS"
--	-------------------------------	--

NOTES:-

1. Affected format area is not updated when filled to end with rows of alternate numbers and "?" symbols. Updating continues if individual lines of "?" appear.

2. If a user program fault appears in a previously working system, the most likely cause is a faulty memory module corrupting part of the stored data. There is a remote possibility of an addressing fault on the video processor causing data to be misread; this would tend to introduce multiple faults simultaneously.

3. When "?" symbols appear in mid-picture, the start position of the "?" symbols indicates the position of the invalid instruction within the format definition.

8. SOFTWARE ISSUE DETAILS

8.1 Summary of changes

This table summarises the significant functional differences introduced by software revisions of paged and logging video.

Issue date	Pgd vid	Log vid
---------------	------------	------------

Aug82	A	-	Initial issue.
Feb83	B	-	Minor faults corrected.
Jun83	-	A	Initial issue.
Mar84	C	B	Minor faults corrected. DRN18 added. 250 series compatibility added.
Jly84	D	C	Minor faults corrected. DRN18 extended to use different locations for different video numbers DRN19 added.

Appendix A

Standard Character Set Ref STD A

Table 17 Semigraphic characters

Cell divided into 2x3 matrix of elements.
Code defines elements on:-
Calculate code (using hexadecimal arithmetic) as @80 + sum of elements ON

@80 +	@20	@10
	@8	@4
	@2	@1

Range @80 (all off) to @BF (all on)

10=@A, 11=@B, 12=@C, 13=@D, 14=@E, 15=@F

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
@80																
@90																
@A0																
@B0																

Table 18 Pictorial characters

Display	Codes
Boundary or pipe (upper 1/2 of cell)	@16 @4 @E1 @5 @17 @18 @13 @10 @12 @D6 @F @C0 @C1 @E
Boundary or pipe (middle of cell)	@D7 @D8 @DD @19
Boundary or pipe (lower 1/2 of cell)	@15 @14 @7 @C8 @11 @C3 @C2 @6
GEC logo	@1A, @1B, @1C, @1D 4 adjacent cells in sequence
Fine lines e.g. graticule	@1 @5F @7C
Misc. characters (bar charts)	@2 @3 @8 @B @C 2 3 5 9 10 12 12 12 12 12

TABLE A3 ASCII/ISO-7 characters

@20	@30 0	@40 @	@50 P	@60 `	@70 p
@21 !	@31 1	@41 A	@51 Q	@61 a	@71 q
@22 "	@32 2	@42 B	@52 R	@62 b	@72 r
@23 #	@33 3	@43 C	@53 S	@63 c	@73 s
@24 \$	@34 4	@44 D	@54 T	@64 d	@74 t
@25 %	@35 5	@45 E	@55 U	@65 e	@75 u
@26 &	@36 6	@46 F	@56 V	@66 f	@76 v
@27 '	@37 7	@47 G	@57 W	@67 g	@77 w
@28 (	@38 8	@48 H	@58 X	@68 h	@78 x
@29)	@39 9	@49 I	@59 Y	@69 i	@79 y
@2A *	@3A :	@4A J	@5A Z	@6A j	@7A z
@2B +	@3B ;	@4B K	@5B C	@6B k	@7B c
@2C ,	@3C <	@4C L	@5C \	@6C l	@7C l
@2D -	@3D =	@4D M	@5D J	@6D m	@7D }
@2E .	@3E >	@4E N	@5E ^	@6E n	@7E ~
@2F /	@3F ?	@4E O	@5F _	@6F o	@7F

Character entry using portable programmer type 8920 (version 4) :-

1. Depress (and hold) shift key for lower case letters.
2. Use function keys for #[]%\$"() ;:,+*<>
3. Use hex code for {}@!'&

Character entry when using the 8922 System Programmer is much easier since all punctuation is available directly on the keyboard.

Table 19 Structure of large characters

Each character is 3x3 cells

Large numbers can be produced automatically by DRN type 9.

Large text (including numbers) can be produced by entering hex. code for each cell. Even larger characters (6 cells wide x 3 cells high) may be produced by making each cell double width.

KEY — = space produced by pressing space bar (NOT followed by comma)

A	B	C	D
@C0,@4,@C1, @D7,@D8,@DD, @DE,—@DE,	@16,@4,@C1, @D7,@D8,@DC, @15,@14,@C2,	@C0,@4,@C1, @6,— @C3,@14,@C2,	@15,@4,@C1, @6,—@6, @15,@14,@C2,
E	F	G	H
@16,@4,@D5, @D7,@D8,— @15,@14,@CC,	@16,@4,@D5, @D7,@D8,— @DE,—	@C0,@4,@C1, @6,—@11, @C3,@14,@DF,	@E0,—@E0, @D7,@D8,@DD, @DE,—@DE,
I	J	K	L
—@E1,— —@6,— —@C8,—	@CD,@E1,@D5, —@6,— @C3,@C2,—	@E0,@E2,@E3, @E4,@E5,— @DE,@E6,@E7,	@E0,— @6,— @15,@14,@CC,
M	N	O	P
@E8,@E9,@EA, @6,@EB,@6, @DE,—@DE,	@E8,@EC,@EO, @6,@ED,@6, @DE,@E6,@EE,	@C0,@4,@C1, @6,—@6, @C3,@14,@C2,	@16,@4,@C1, @D7,@D8,@C6, @DE,—
Q	R	S	T
@C0,@4,@C1, @6,—@6, @C3,@14,@EF,	@16,@4,@C1, @D7,@FO,@C6, @DE,@E6,@E7,	@C0,@4,@C1, @C5,@D8,@C4, @C3,@14,@C2,	@CD,@E1,@D5, —@6,— —@DE,—
U	V	W	X
@EO,—@EO, @6,—@6, @C3,@14,@C2,	@F1,—@F2, @F3,@F4,@F5, —@F6,—	@EO,—@EO, @6,@F7,@6, @F8,@F9,@EE,	@FA,@E9,@FB, —@FC,— @D9,@F9,@E7,
Y	Z	Ø	1
@FA,@E9,@FB, —@FD,— —@DE,—	@CD,@CE,@CF, —@DO,— @CA,@CB,@CC,	@C0,@CE,@FF, @6,@DO,@6, @FE,@CB,@C2,	—@C7,— —@6,— —@C8,—
2	3	4	5
@C0,@4,@C1, —@C9,@C2, @CA,@CB,@CC,	@CD,@CE,@CF, —@D1,@C1, @C3,@14,@C2,	—@D2,— @CA,@D3,@CC, —@D4,—	@16,@4,@D5, @D6,@4,@C1, @C3,@14,@C2,
6	7	8	9
@C0,@4,@C1, @D7,@D8,@C4, @C3,@14,@C2,	@CD,@CE,@CF, —@DO,— @D9,@DA,—	@C0,@4,@C1, @DB,@D8,@DC, @C3,@14,@C2,	@C0,@4,@C1, @C5,@D8,@DD, @C3,@14,@C2,
?			
@C0,@4,@C1, Double width —@C9,@C2, ? looks best —@A2,— with single width @A2, at bottom			

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REF

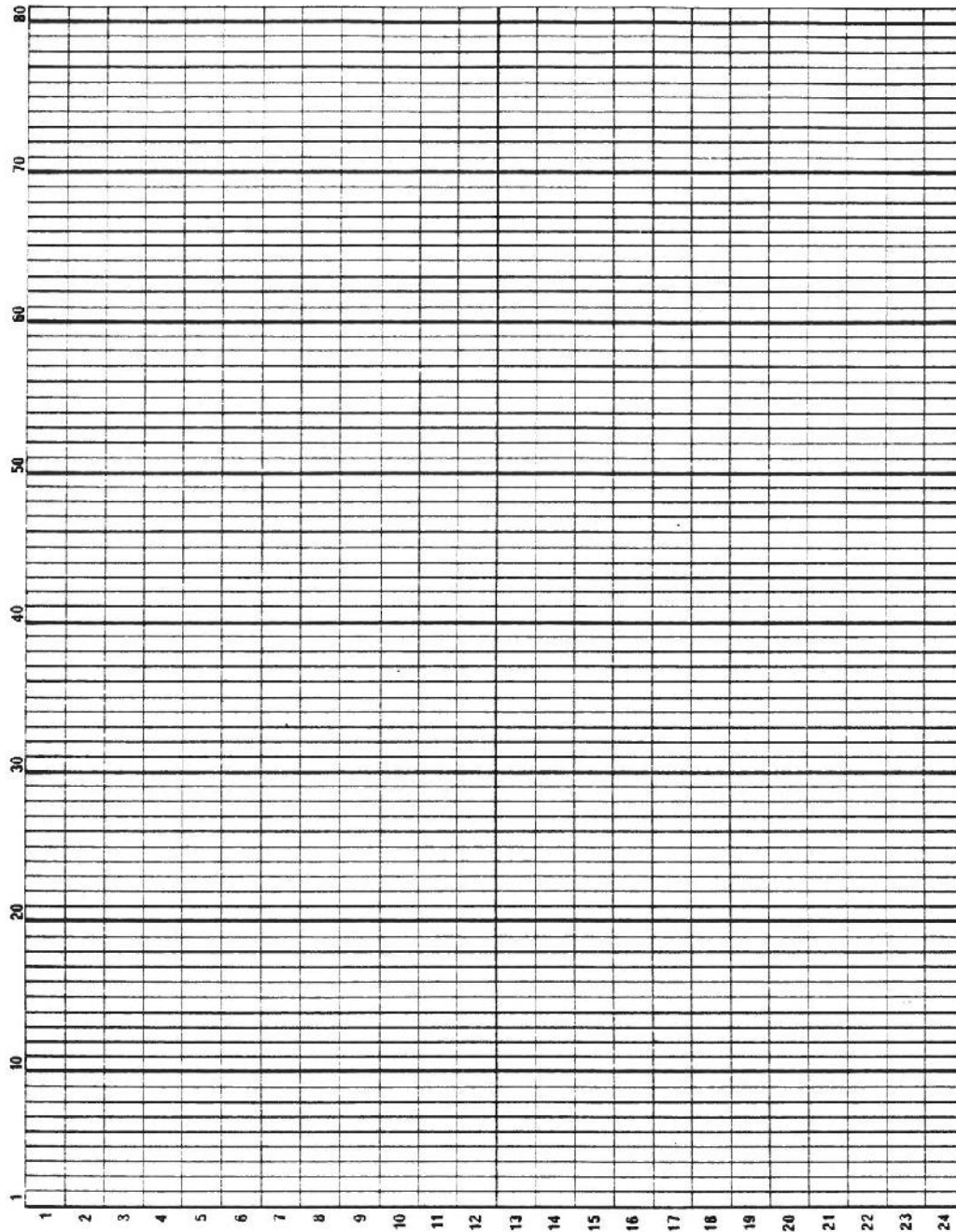
GEM 80 VIDEO DISPLAY FORMAT

SHEET

(W0.81)

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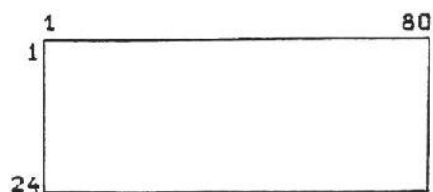
ICE 079



ISSUE	A	B	C	D		GEC
DATE						
AUTHOR						

DESIGN AID FOR FORMAT DATA

PARTITION DATA:-



Area	Start Column	End Column	Start Row	End Row
1	1		1	
2				
3				
4				

0 = start column of non-existent area

Sketch partition lines (0 or 1 horizontal line,
0, 1 or 2 vertical lines).
Number areas 1 to 4.

RAM PAGE NO.	FORMAT NUMBERS AVAILABLE	FORMAT NUMBERS USED
0	1 - 25	
1	26 - 50	
2	51 - 75	
3	76 - 100	
4	101 - 125	
5	126 - 150	
6	151 - 175	
7	176 - 200	
8	201 - 225	

PROGRAMMING EXERCISES FOR BEGINNERS

These simple exercises are best performed in sequence using an actual GEM80 system to obtain hands-on experience.

After working through these exercise a beginner should be in a position to start programming his own formats.

Exercise 1 To set up format data

Objectives: Set up partition data as illustrated.
Set up (arbitrary) no. of formats

Preliminaries (a) Connect programmer (section 3.2)
(b) Clear previously stored formats (section 3.6.7)
(c) Set host controller L table L0=1; L1=2.
(d) With programmer connected to video processor, select initial entry option 7 and press space bar to begin.
(e) Enter 4 as SELECTION NUMBER to change current partition data.

1	50 51	80
AREA 1	AREA 2	

KEYS PRESSED	DISPLAY ON PROGRAMMER SCREEN	REMARKS
NOTE (SP)= space (CR)= carriage return (ESC)= escape	CURRENT PARTITION DATA IS AREA 1 1 80 1 24 AREA 2 0 0 0 0 AREA 3 0 0 0 0 AREA 4 0 0 0 0	This data will be different if someone has previously set up a valid set of data.
Y	DO YOU WANT TO CHANGE THIS? >Y	
1(SP)	INPUT AREA (1-4) >1	
1(SP)50(SP)	INPUT COLUMN DATA (START THEN END) >1 50	
1(SP)24(SP)	INPUT LINE DATA (START THEN END) >1 24	
	AREA 1 1 50 1 24 AREA 2 0 0 0 0 AREA 3 0 0 0 0 AREA 4 0 0 0 0	Partition data is set up for each area in turn.
Y	DO YOU WANT TO CHANGE THIS? >Y	
2	INPUT AREA (1-4) >2	
51(SP)80(SP)	INPUT COLUMN DATA (START THEN END) >51 80	
1(SP)24(SP)	INPUT LINE DATA (START THEN END) >1 24	
	AREA 1 1 50 1 24 AREA 2 51 80 1 24 AREA 3 0 0 0 0 AREA 4 0 0 0 0	Partition data as required.
N	DO YOU WANT TO CHANGE THIS? >N	

KEYS PRESSED	DISPLAY ON PROGRAMMER SCREEN	REMARKS
	GEM80 PAGED VIDEO	
	0 EXTERNAL RAM TEST	We need to specify the number of formats and Page number we are going to use. Assume we want 10 formats in Page 0. To preset this we enter 5 as selection number.
	1 TERMINATE	
	2 SET PAGE NUMBER FOR MAGNETIC TAP..	
	3 SET CONTROLLER TYPE	
	4 EDIT PARTITION DATA	
	5 CHANGE NUMBER OF FORMAT DEFINITIONS	
5	9 EDIT/PRINT A FORMAT DEFINITION	
	ENTER SELECTION NUMBER []	
	WHICH VIDEO PAGE DO YOU WANT TO USE?	
0(SP)	>0	
	THE NUMBER OF FORMATS IS 1	
	DO YOU WANT TO CHANGE THIS?	
Y	>Y	
	SPECIFY No. OF FORMATS(1-25)	
10(SP)	>10	
	THE NUMBER OF FORMATS IS 10	
	DO YOU WANT TO CHANGE THIS?	
N	>N	
	GEM80 PAGED VIDEO	
	0 EXTERNAL RAM TEST	Entering NO we will return to the GEM80 VIDEO menu. Now we are in the position to edit a format.
	1 TERMINATE	
	2 SET PAGE NUMBER FOR MAGNETIC TAP..	
	9 EDIT A FORMAT DEFINITION	

Exercise 2. To program and display a simple format

Objectives	Program format containing fixed text as illustrated with format occupying whole screen.	THIS IS FORMAT NO 1 characters white on black background
9	ENTER SELECTION NUMBER [9]	
	INPUT FORMAT No	
1(SP)	>1	
	FORMAT SIZE(WIDTH THEN DEPTH) IS	
	80 24	
	DO YOU WANT TO CHANGE THIS?	
n	>N	
	IN FORMAT EDIT MODE NOW	
I^1,27,1^ THIS	>I^1,27,1^ THIS IS FORMAT NO 1	Insert fixed data instructions to set whole area attributes (table 4.6 and table 6.3) and one line of fixed text, using(CR) to mark end of line.
(SP)IS(SP)FORMAT		
(SP)NO(SP)1(CR)		
(ESC)(ESC)		
V(ESC)(ESC)	>V\$\$	Display edited format Exit and store
E(ESC)(ESC)	>E\$\$	

Exercise 3 To program a 2nd simple format and display
2 formats simultaneously.

Objectives: Edit format 1 size to fit area 1
Use editor to generate format 2
from format 1
Obtain display as illustrated:

THIS IS FORMAT NO 1	THIS IS FORMAT NO 2
1	5051 80

White characters on black background Yellow on blue

KEYS PRESSED	DISPLAY ON PROGRAMMER SCREEN	REMARKS
	GEM80 PAGED VIDEO	
	0 EXTERNAL RAM TEST	
	1 TERMINATE	
9	9 EDIT/PRINT A FORMAT DEFINITION	
	ENTER SELECTION NUMBER []	
	INPUT FORMAT No	
1(SP)	>1	
	FORMAT SIZE(WIDTH THEN DEPTH)	
	IS 80 24	
	DO YOU WANT TO CHANGE THIS?	
Y	>Y	
	INPUT WIDTH,DEPTH	
30(SP)24(SP)	>30 24	Reduce width of format no. 1 so it is small enough to fit either area 1 or area 2.
	FORMAT SIZE(WIDTH THEN DEPTH)	
	IS 30 24	
	DO YOU WANT TO CHANGE THIS?	
N	>N	
	IN EDIT MODE NOW	
E(ESC)(ESC)	>E\$	Escape and store
	GEM80 PAGED VIDEO	
	0 EXTERNAL RAM TEST	
	1 TERMINATE	
	8 COPY FORMAT DEFINITIONS	
	9 EDIT/PRINT A FORMAT DEFINITION	
	ENTER SELECTION NUMBER []	
	INPUT SOURCE/DESTINATION FORMAT NUMBERS	
8	>1 2	We need to copy format 1 to 2 so we can edit 2 without altering 1. Select option 8 from the menu.
	DO YOU WANT TO CONTINUE(Yes or No)	
1(SP)2(SP)	>N	
N		
	GEM80 PAGED VIDEO	
	0 EXTERNAL RAM TEST	
	1 TERMINATE	
	9 EDIT/PRINT A FORMAT DEFINITION	
	ENTER SELECTION NUMBER []	
	INPUT FORMAT No	
9	>2	
2(SP)	FORMAT SIZE(WIDTH THEN DEPTH)	
	IS 30 24	
	DO YOU WANT TO CHANGE THIS?	
N	>N	Returned to the menu Now we can edit 2 and 1 will not be affected.
	IN EDIT MODE NOW	

10T(ESC)(ESC)	>10T\$\$	
	^^1,07,1^THIS IS FORMAT NO 1	Display current de- finition on progra- mmer screen.
	^E	Change attribute
S7(ESC)E(ESC)(ESC)	>S7\$E\$\$	
SNO(SP)1(SP)(ESC)	>SNO 1\$NO 2\$\$	Change format no.
NO(SP)2(ESC)(ESC)		
B10T(ESC)(ESC)	>B10T\$\$	Display edited for- mat definition on programmer screen.
	^^1,0E,1^THIS IS FORMAT NO 2	
	^E	
V(ESC)(ESC)	>V\$\$	View the edited for- mat.
E(ESC)(ESC)	>E\$\$	Exit and store.

NOTE.- At this point both formats should be displayed on the video monitor.
If not, go through the whole procedure again.
Once the display is finished, enter selection number 1 to return
to the programmer selection menu.

Discussion:

As programmed these formats will fit in both areas 1 and 2. Temporarily
alter host controller L table contents to observe (i.e. LO=2; L1=1).
Edit format 1 to change format size from 30 24 to 50 24 and then VIEW
and EXIT this format.
Observe area 2 full of red "?" indicating definition too large to fit.
Set LO=1; L1=2 when finished.

NOTE.

Always enter option 1 to terminate GEM80 VIDEO mode, before trying
to display a format. If you do not do this, the format displayed will
be the one before entering the GEM80 VIDEO mode, or the last one
displayed using the VIEW command. This is because when entering EDIT
mode the format being displayed is frozen.
For example:
Format 1 is requested via LO and has been corrected using editor. Still
in GEM80 VIDEO mode, set LO=2. The format being displayed is 1 even
though LO has been set to 2, because we have not terminated the EDIT
mode. Now if we terminate GEM80 VIDEO mode by selecting option 1
format 2 will be displayed.

Exercise 4 To obtain variable display

Objectives: Edit format 1 definition to obtain decimal display as illustrated

THIS IS FORMAT NO 1

CONTENTS OF LOCATION G1 ARE -20600

Preliminaries

- Insert a program in the host controller so that G1 can be seen to vary. A typical program making G1 cycle in +-32600 is illustrated.
- Reconnect programmer to Video processor and select option 7.
- Proceed as in previous exercise to get into edit mode for format 1, ensuring format width is 50.

```

|---] [-----OBEY---|
|  EO.0                                BLOCK |
|  * *  START OF BLOCK  * *             |
|  |<AND>--<ADD>--]/[-----<OUT>--| |
|  |  G1      200  EO.7  |             G1 |
|  |                                     |
|  |<AND>--] [-----+             |
|  | -32600  EO.7                               |
|  |  * *  END OF BLOCK  * *             |

```

KEYS PRESSED	DISPLAY ON PROGRAMMER SCREEN	REMARKS
10T(ESC)(ESC)	IN FORMAT EDIT MODE NOW >10T\$\$ ^1,07,1^THIS IS FORMAT NO 1	Display current definition
LI(CR)CONTENTS(SP) OF(SP)LOCATION(SP)G1 (SP)ARE:(SP)^6,2,G1^ (CR)(ESC)(ESC)	^E >LI CONTENTS OF LOCATION G1 ARE: ^6,2,G1^ (CR) \$\$	Move pointer 1 line. Insert (CR) for blank line then fixed text and DRN (see tables 4.7 & 4.8)
B10T(ESC)(ESC)	>B10T\$\$ ^1,07,1^THIS IS FORMAT NO 1 CONTENTS OF LOCATION G1 ARE: ^6,2,G1^	Display edited definition
V(ESC)(ESC)	^E >V\$\$	View to see the effect of the changes.
E(ESC)(ESC)	>E\$\$	Exit and store
	GEM80 PAGED VIDEO 0 EXTERNAL RAM TEST 9 EDIT/PRINT A FORMAT DEFINITION ENTER SELECTION NUMBER [1]	Enter 1 to terminate edit mode

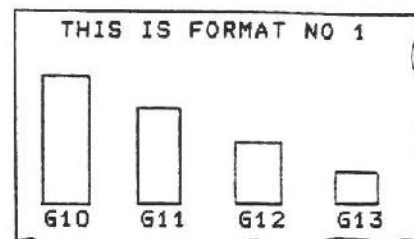
Discussion: To observe large numbers edit definition to add 2 blank lines before that containing DRN type 9 and then substitute DRN type 9.
(typical command S^6,2,\$^6,9\$\$)

Exercise 5 To make use of repeat facilities

Objectives: Edit format 1 definitions to obtain bar chart display as illustrated

Preliminaries

- (a) Insert a program in host controller so that G10 to G13 can be seen to vary. A typical program making G10 cycle in range 0 to 12, with G11 to G13 storing previous values, as illustrated
- (b) Enter format edit mode for format number 1



```

[---] [-----OBEY---]
| EO.1 | BLOCK |
| * * START OF BLOCK * * |
| LOCATE MOVE |
| -<AND>--SPEC--VALUE--SPEC--VALUE-<OUT>-- |
| 0 S20 G10 T20 4 F100 |
| +< > |
| LOCATE |
| -<AND>--SPEC--VALUE-- |
| 0 S20 G11 |
| -<AND>--<SUB>-- |
| G10 11 |
| -<AND>--<ADD>-- |
| G10 1 G9.15 |
| * * END OF BLOCK * * |
  
```

KEYS PRESSED	DISPLAY ON PROGRAMMER SCREEN	REMARKS
2LK(ESC)(ESC)	IN FORMAT EDIT MODE NOW >2LK\$\$	Move pointer and kill display of G1
4I(CR)(ESC)(ESC)	>4I \$\$	Insert 4 blank lines
I^R4,(CR)(SP)^4,13, G10,+1^(SP)(SP)20, (CR)G10(SP)G11(SP) G12(SP)G13(CR)(ESC) (ESC)	>I^R4, ^4,13,G10,+1^ 20, G10 G11 G12 G13 \$\$	Insert repeat containing spaces and vertical bar DRN. After repeat insert fixed text on next line.
B10T(ESC)(ESC)	>B10T\$\$ ^^1,27,1^THIS IS FORMAT NO 1 ^R4, ^4,13,G10,+1^ 20, G10 G11 G12 G13	Display edited definition
V(ESC)(ESC)	>V\$\$	Display format with latest changes.
E(ESC)(ESC)	>E\$\$	Exit and store
	GEM80 PAGED VIDEO	
	0 EXTERNAL RAM TEST 1 TERMINATE 9 EDIT/PRINT A FORMAT DEFINITION ENTER SELECTION NUMBER [1]	Terminate edit mode

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