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Viewdata Service

Terminal Specification

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VIEWDATA SERVICE TERMINAL SPECIFICATION

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1 INTRODUCTION.

The British Post Office Viewdata service is an interactive information retrieval and message handling system which uses the Public Switched Telephone Network (PSTN) to provide user's terminals with access to the computer based database. A simple protocol allows the user to select the information required by the use of 12 buttons on a keypad associated with the terminal. The terminal consists of a Television Receiver with additional circuitry to allow it to interface with the PSTN and display the data it receives. This specification defines the way in which the computer exchanges data with the terminal, and the conditions which must be met before the Post Office will grant permission for a particular model of terminal to be connected to the system.

2 FUNCTIONAL DESCRIPTION

The terminal is connected to the telephone system by means of a jack plug----------Section 3.1

The TV is switched on and a Viewdata call is initiated by pressing one or more buttons on the keypad ---------- Section 3.6

This starts an automatic dialler which dials the telephone number of the Viewdata Computer----------Section 3.4

Calls to other computers may be set up using the telephone dial or the autodialler. The computer answers the call and sends a 1300Hz tone. This is one of the 2 frequencies used by the computer to send binary data to the terminal---------- Section 4.1

If the call fails the user is made aware of this via the TV loudspeaker ---------- Sect 3.6

For a successful call the terminal returns a 390Hz tone to the computer. This is one of the 2 frequencies used in the return channel ---------- Section 4.2

The computer then begins to send data to the terminal at 1200bits/s ---------- Section 5.1

The codes used are the British Teletext variant of the ISO 646 7-bit code standard ---------- Section 5.2

The computer sends a code requesting the terminal's identity and the terminal responds by sending an identification number of up to 16 digits ---------- Section 6.1

The computer checks this number and then sends data to be displayed on the screen in a 24 rowX40 character format ---- Section 5.3

Control characters are used to clear the screen and to control the position and display of the cursor ---------- Section 5.4

The cursor defines the position of the next character to be received ---------- Section 5.4

The user presses the appropriate keys on the keypad according to the information displayed on the screen. ---------- Section 5.6

This sends data to the computer at 75 bit/s -------- Section 5.1

Other Control Characters are transmitted by the computer to cause the data displayed on the screen to be recorded by a tape recorder. The tape recorder enables the user to save cost by storing frequently used information ----------Section 6.5

A Hard Copy printer option allows the user to make printed copies of the information ---------- Section 6.6

The numbers associated with the Autodialler and identity code are stored at the terminal in Non Volatile Memory ----------Section 6.3

When the terminal is first installed or when any changes are required the numbers will be transmitted to the terminal using the normal transmission system ---------- Section 6.2

The user may clear the call at any time by returning to the TV mode using the keypad ---------- Section 3.6

The Post Office requires that the equipment shall present no dangerous condition to the line interface ---------- Section 7.1

The Post Office will examine each model of receiver before granting permission to attach units of that type to the network ---------- Section 7.10

3 LINE TERMINATION & DIALLING

3.1 Physical Termination

The user's telephone connection will be terminated by the Post Office in a Jack Socket type 96A. (See Appendix 1). The terminal shall be terminated in a suitably compatible plug (eg. Post Office Plug Type 505 - See Appendix 2). The telephone connections will be as indicated in fig 2 for most installations. For some configurations of existing telephones the connections may be of the form shown in fig 1 (for shared service installations fig 3 will apply).

3.2 D C Conditions

Four sets of DC conditions are specified for the line interface:-

a) The off-line condition applies when the terminal is not using the telephone line.

b) The line holding condition applies when the terminal is sending tones to or receiving tones from the line

c) The pulsing make condition applies during the make part of a dialled digit pulse.

d) The pulsing break condition applies during the break part of a dialled digit pulse.

	Plug Points	Resistance
A)Off-line Condition	2-3	> 5Mohm *
	2-4	> 5Mohm *
	1-5	< 10 ohm
B)Line holding	2-3	< 300ohm †
	2-4	> 5Mohm *
	1-5	> 5Mohm
C)Pulsing Make	2-3	< 50ohm
	2-4	> 5Mohm *
	1-5	> 5Mohm
D)Pulsing Break	2-3	> 5Mohm
	2-4	> 5Mohm
	1-5	> 5Mohm *

* measured at 250 vdc. All conditions to be independent of polarity.

† measured with line currents up to 120mA

When the terminal is in the idle state condition (a) applies. When the terminal is instructed to go on-line at the start of a call the condition (b) is applied. The autodialling sequence is started when the user is satisfied that the line is available.

3.3 Autodialling

The digit signals shall appear as loop disconnect pulses between plug points 2 and 3 at a repetition rate of between 9 and 11 pulses per second. The break period shall be between 63% and 70% of the total pulse

period (break plus make). The length of the break period (condition (d)) of each pulse shall be within the limits of 57.2 to 77.3 ms and the length of the make period (condition (c)) between any two break periods shall be within the limits 27.2 to 41.1ms. For a period of at least 5ms before and after pulsing condition (c) shall apply.

The digit to be dialled represents the number of break pulses to be sent except that digit 0 represents 10 pulses. Interdigit pauses shall be provided. The duration shall be between 800 & 900 ms. During the pause condition (b) shall apply except during the first and last 5 ms periods when condition (c) shall apply. Fig 4 explains this diagramatically.

When the terminal is transferring to the line holding state the high impedance between plug points 1 and 5 must not be presented more than 20ms before the low impedance is presented between plug points 2 and 3.

For Shared Service working ("Party Lines") a DC loop of less than 300ohms shall be applied between plug points 2 and 4 for 1 to 2 seconds before the line holding condition is applied.

A spark quench circuit across the pulsing contacts is recommended This consists typically of a capacitance of 2uF in series with a resistance of 30-100 ohms.

The test conditions used when determining the repetition rate and ratio of autodialling signals are as follows:-

1) The terminal is connected via plug points 2 and 3 to a non reactive dc supply having an emf of 10 to 50 volts and a resistance such that the current which flows during the make period is less than 100 mA.

2) Each pulse of the pulse train must be within the repetition rate and ratio stated above. The break period is taken as the time between the instant when the steady state current commences to fall and the instant when the current commences its final rise.

3.4 Telephone Numbers.

Two computer centres having identical computers and stored information will serve each user to give security of data in case of disaster and diversity of telephone routing in case of network congestion. To take advantage of this terminals should be provided with storage for at least 2 telephone numbers. The first number will usually be used, the second will be used on the second attempt at contacting Viewdata. A maximum of six computer centre telephone numbers may be stored in the terminal. Up to four buttons may be provided to initiate calls. The first button shall access the Viewdata pair of numbers. The second button may access another pair and the third and fourth buttons may access a single number each. The minimum facility which shall be provided is one dual number (Viewdata) dialler.

3.5 A C Conditions

When the terminal is on-line (i.e. line holding condition) it shall present an impedance between 400 and 900 ohms at an angle not greater than 45 degrees for all frequencies between 300Hz and 3400Hz.

3.6 Connection Protocol

When a call is initiated:-

1)The line must be seized (Condition b).

2) The user must be sure the line is available i.e. dial tone returned (The telephone may already be in use).This may conveniently be checked by using the TV loudspeaker to monitor the line. To limit the level of crosstalk reproduced,it must not be possible to make speech or other signals intelligible when their levels at the telephone line terminals are below -57dBm. Telephone network supervisory tones are to be made audible on the loudspeaker at all volume control settings. The tones may be expected to be in the range 0dBm to -30dBm, measured during a burst. The standard tones used on the network are given in Appendix 3. Signals from the telephone line above 10 kHz must be attenuated by at least 20 dB relative to the gain at 1kHz. This is to prevent interference due to modulated carrier signals which may appear across the telephone terminals at levels not exceeding -45 dBm and to protect the privacy of the telephone network.

3) The dialler must be started.

4) The user must be informed if the call fails. Recorded announcements and tones will be used to indicate congestion and the use of the loudspeaker is again recommended,as all such announcements must be made audible to the user.

5) The terminal must be made ready to receive data signals and must send carrier(390Hz) to the computer after at least 600ms of the 1300 Hz carrier is detected.

6) The user must be able to clear the telephone connection at any time by reverting to TV or some other (eg. Viewdata-hold-last-page) mode.

7) It must be possible to achieve (5) above when the call has been established by use of the normal telephone (for calls to other computers) or by the distant end subscriber (eg. for calls made from the Viewdata control centre).

8) If at any time the level of carrier received from the computer falls below -53dBm for more than 600ms the telephone connection shall be cleared (Condition a).

9) Whenever the terminal is in line-holding or pulsing-make condition,a clear visual indication shall be given to the user that the telephone line is in use.

The exact user protocol is not defined but those keys which are used to initiate a Viewdata call shall be clearly identified by the use of the Viewdata colour (green).

4 TRANSMISSION SYSTEM

The data is transmitted over the PSTN using an asymmetric full-duplex frequency-shift-keyed carrier system. The forward (computer to terminal) channel and backward (terminal to computer) channel each use a pair of frequencies in the upper and lower parts respectively of the voice frequency band.

4.1 Forward Channel

Data sent from the computer will be transmitted as follows:-

Binary 1 1300 Hz
Binary 0 2100 Hz

The long term stability of these frequencies will be +- 16 Hz

4.2 Backward Channel

Data shall be transmitted from the terminal as follows:-

Binary 1 390 Hz
Binary 0 450 Hz

The long term stability of these frequencies shall be +- 5Hz.

The levels of these tones and any harmonic components shall conform to the limitations imposed by fig 5. Individual spectral components above 3.4 kHz shall conform to fig 6. Both of these criteria apply to transverse components (i.e.across plug points 2 and 3) measured in 600 .Longitudinal components (plug points 2 and 3 shorted and measured relative to earth) into a 600 load shall be below -40dBm at all frequencies between 2KHz and 200KHz.

4.3 Levels

When connected to a 600 ohm non-reactive load in place of the telephone line the signal level shall not exceed -9 dBm mean power. The transmission level of the forward channel tones at the computer centre will be -13dBm.

4.4 Line Losses.

Data signals from the terminal and the computer centre will be attenuated by the telephone line. The worst case attenuation likely to be experienced on any connection to the Viewdata computer centre is given in fig 7. The attenuation can be assumed to be between zero and the limits shown. Data signals will be accepted by the computer centre provided that the signal level at the computer end is greater than -43dBm.

4.5 Line Group Delay

Although Group Delay is not expected to be a problem on calls to the Viewdata centre, the worst case line characteristic likely to be encountered is shown in fig 8.

4.6 Performance

A performance specification of a satisfactory modem is given, together with a test procedure, in Appendix 5.

5 DATA CODING & DISPLAY

5.1 Data Format & Speeds

Data is handled in the system as 7 bit "characters". Each group of 7 bits defines a code located in the code table fig 9. For transmission down the line the 7 bits are sent in an asynchronous stop start 10 bit format. This consists of

Start bit
Bit 1 (least significant bit) of data
Bit 2
Bit 3
Bit 4
Bit 5
Bit 6
Bit 7
Parity Bit
Stop Bit

This may be followed by a delay of arbitrary length and then the start bit of the next character. The delay is normally zero during continuous data streams.

The start bit is Binary 0
The Stop bit is Binary 1
Idle Condition between Characters is Binary 1
The Parity bit (EVEN) is :-
Binary 1 if there is an ODD number of 1's in the 7 bits character
Binary 0 if there is an EVEN number of 1's in the 7 bit character

The period of each bit in the 1200 bit/s channel will be 1/1200 second +- .01%
The period of each bit in the 75 bit/s channel shall be 1/75 second +- 1 %

5.2 Codes

The code table is shown in fig 9. Codes in columns 2 3 4 5 6 and 7 represent Alphanumeric characters to be stored and displayed on the screen.

Codes in Columns 0 and 1 are control codes and are not stored or displayed. These codes are used mainly to control the storage of column 2-7 codes. Columns 2a 3a 6a and 7a show a series of graphics symbols. These are displayed on the screen during graphics mode instead of the corresponding alphanumeric code in columns 2 3 6 and 7. Graphics mode obtains after a graphics control character and before either an alpha control character or the end of a line.

Colums 4b and 5b contain display control codes including the alpha and graphics control codes. These are stored in memory and act during display time to change the display modes. They are transmitted by means of an Escape Sequence. This consists of ESC (Column 1 character 11 or 1/11 for short) followed by a character in column 4 or 5. eg. Graphics blue mode is set by transmitting ESC,T (1/11, 5/4) The escape

contained in the row following the one which contains a double height control character (4b/13). Double height characters should be extended downwards into the following display row. The normal Height control character (4b/12) may be received within the Double Height row. In this case, characters following the Normal Height control should be displayed normally on the first row of a Double Height pair of rows. The corresponding character positions in the following row should be displayed as unboxed spaces in the same background colour as the corresponding character rectangles in the first row of the Double Height pair of rows. The pair of rows is regarded as two rows for cursor addressing purposes.

5.5.6 Contiguous Graphics. The Contiguous Graphics set consists of those characters located in columns 2a, 3a, 6a and 7a of Fig 9 together with the alphanumeric characters in columns 4 and 5 when they are used in the Graphics mode. The character rectangle is divided into 6 equal areas and a graphics character from columns 2a, 3a, 6a or 7a is displayed by illuminating particular areas. This is apparent by an inspection of Fig 9 (the filled in areas being the ones illuminated). In the Contiguous Graphics mode, selected by codes 1/11 and 5b/9, each graphics character will fill the rectangle areas allocated to that character.

5.5.7 Separated Graphics. The Separated Graphics set consists of the same codes as those in the Contiguous Graphics set. In the Separated Graphics mode, selected by codes 1/11 and 5b/10, each charater is displayed as a set of separated bright rectangles within the perimeter of the character rectangle.

5.5.8 Hold Graphics. Generally all control characters are displayed as spaces, implying at least one space between character rectangles with different display colours in the same row. The Hold Graphics mode allows a limited range of abrupt display colour changes. This is achieved by calling for the display of a held graphics character in the character rectangle which corresponds to any control character occurring during the Graphics mode. This held graphics character is displayed in the modes already obtaining for the character position in which it is displayed. The held graphics character is only defined during the Graphics mode. It is then the most recent character in cols 2a, 3a, 6a or 7a providing that there has been no intervening change in either the Alphanumerics Graphics or the Normal/Double Height modes. This character is to be displayed in the Contiguous or Separated mode as when it was first displayed. In the absence of such a character the held graphics character is considered to be a space. Hold graphics mode is invoked by the Hold Graphics code 5b/14 and released by Release Graphics 5b/15

5.6 Transmission Codes

All the codes to be transmitted to the Computer are shown in fig 9. Most users will have no use for certain codes eg. Col 3b, DC1, DC4, ENQ. To use the basic Viewdata information service the numbers 0-9 (3/0-3/9), star(*, 2/10) and square (#, 5/15) are the only codes required. Mathematic services on Viewdata will use lower case X (7/8) as a multiplication symbol. Alphabetic characters will be used for message services.

6 PERIPHERAL FACILITIES

6.1 Identity Code

When the terminal receives ENQ(0/5) it shall begin (within 50ms) to send its identity number to the computer. This will take the form of a string of up to 16 digits. They will be sent in the same format as normal data at 75 bit/s. The computer will transmit ENQ in the format FF,NUL,NUL,NUL,ENQ..... and will make a second attempt if a valid identity code is not received.

6.2 Programming

The identity code and the telephone numbers of the computer centres will be stored in the terminal. Programming may be achieved by the dealer or manufacturer but an automatic system described in Appendix 6 is favoured as the telephone numbers may need to be changed when for example the receiver is moved to another area.

Alternatively telephone numbers may for example be inserted from the user's keypad and the identity code may be stored in a PROM. The user shall not be allowed to alter the identity number of the terminal. The exact method of storing and programming these numbers should be discussed with the Post Office before permission to attach is sought.

6.3 Non Volatile Memory

Any non volatile memory used for storing the identity and telephone numbers in such an automatic system shall have a no-usage data retention time of at least 60 days. It shall have a minimum number of accesses of 365000.

6.4 Peripheral Control Codes

Other codes for the control of external devices etc. are defined in Appendix 6.

6.5 Tape Recorder

A tape recorder may be used to record frames of data. Details of the control codes used are given in Appendix 6.

6.6 Hard Copy

No control codes will be defined for the control of a hard copy unit which may be used for printing copies of frames of data.

7 SAFETY & PERMISSION TO ATTACH

7.1 General

The manufacturer must satisfy the Post Office that the equipment meets the safety requirements given below. The requirements call for

protection of the telephone line from both longitudinal and transverse voltages which could arise from faults in the equipment.

7.2 Certification of Protection Components

Any device used for protecting the PO line (eg the transformer,relays,fuse and gas discharge tube in Fig 10) must be clearly identified and specified and each type of device certified by its manufacturer as having been tested to and met the requirements given below. The certification must give all appropriate information and test figures and must accompany the initial request for permission to connect the Viewdata Terminal(VDT) to line.

7.3 Transformer Construction

(Quoted from BS 3535:1962).The transformer shall be so designed and constructed that there is no possibility of any connection between input and output windings either directly or through other metal parts.In particular,precautions shall be taken to prevent (i)Displacement of input or output windings or the turns thereof,or of wires for external connections (ii) Undue displacement of parts of windings or internal wiring in the event of rupture or loosening of connections. Random windings shall not be used.

Input and output windings on a single spool,side by side or concentric,shall not be used. The windings must be in accordance with one of the following methods:_

(a) On a single spool with a partition wall between windings,provided that the spool and partition wall are pressed or moulded in one piece.

(b) On separate spools fixed so that the spools cannot move with respect to each other and to the core.

(c) On cheekless formers on separate limbs of the core provided that each layer of the winding is interleaved with insulating material projecting beyond the ends of each layer,and that the windings are impregnated with a hard baking material which fully penetrates the interstices and effectively seals off the end turns.

Accessible metal parts shall be separated from live parts by double insulation except that reinforced insulation may be used on connector sockets, switches and the like where double insulation is not practicable.

7.4 Protection against Longitudinal Voltages

The isolation between connections on either side of the barrier line (see fig 10) and between any of those connections and any other point on the exterior of the barrier components must be 2.8kV or (1400+2V) volts whichever is the greater (see 7.8).

The isolation test consists of applying 2.8kV or (1400+2V) volts to the points concerned for 60 seconds then immediately measuring the insulation resistance at 500 volts dc minimum. The insulation resistance must be not less than 20 Mohms for a transformer and 100 Mohms for a relay.

7.5 Bridging across the Barrier Line

7.5.1 Wiring,pcb tracks and terminals carrying "dangerous" voltages (ie greater than 75V ac rms or 106V dc) or carrying voltages derived from a "dangerous" voltage supply via non-protected devices must be fully insulated against accidental or other contact with connections on the PO side of the barrier line.

7.5.2 Barrier components must not be by-passed by any device which is not an acceptable isolating device.

7.5.3 On printed circuit wiring boards the clearance and creepage distances between conductors connected to opposite sides of the barrier line must meet the requirements of BS 5370 subject to a minimum track separation of (V/100)mm. The voltage concerned is V as defined in 7.8 below.

7.6 Protection against Transverse Voltages

7.6.1 If the transformer saturates at a flux value insufficient to induce a voltage in excess of 75v ac rms into the winding connected to the PO line then a gas discharge tube and fuse as shown in fig 10 are not required.

7.6.2 If a step-down transformer is used such that no voltage in excess of 75v ac rms may be induced into the winding connected to the PO line when V as defined in 7.8 below is applied to the VDT side of the transformer then a gas discharge tube and fuse as shown in fig 10 are not required.

7.6.3 If the transformer does not meet either 7.6.1 or 7.6.2 above then a gas discharge tube and fuse are required as shown in fig 10. Requirements for these devices are:-

7.6.3.1 Gas discharge tube. This must have a maximum striking voltage of 115 volts including tolerances. It must be capable of carrying the fusing current of the fuse.Following rupture of the fuse the gdt must be capable of continuously carrying any leakage current that will flow when voltage V (as defined in 7.8 below) is applied to the VDT side of the transformer.The gdt must be of a type which ,on failure,exhibits a short-circuit across its terminals.

7.6.3.2 Fuse. This must have a rating of 250mA and a prospective current rating of at least 35A. The rating of the fuse must be clearly marked adjacent to its location.

7.7 Current Limited Sources

Any two points within the equipment,including the input and output connections,are regarded as a current-limited source if,when a resistor of the value given in table 1 is connected between the points,the current does not exceed the limits given in table 2. This condition must be met with input and output connections short-circuit,open-circuit or connected to their normal load.

An eht supply up to 25kV with up to 3000pF capacitance connected to it is deemed to meet this requirement provided that the figures in Tables 1 and 2 are met when the capacitance is not connected.

TABLE 1 RESISTANCE LOAD LIMITS FOR VOLTAGE RANGES

VOLTAGE RANGE (VOLTS)	RESISTANCE (OHMS)
0-150	2000
150-250	1000
250-650	800
ABOVE 650	650

TABLE 2 ACCEPTABLE ELECTRICAL CURRENT EXPOSURES

INITIAL CURRENT NOT EXCEEDING (mA)	MAXIMUM EXPOSURE TIME FOR DIRECT CURRENT TO FALL TO 75mA OR LESS (ms)	MAXIMUM EXPOSURE TIME FOR ALTERNATING CURRENT TO FALL TO 10mA OR LESS (ms)
10	No Limit	No Limit
20	"	1000
30	"	500
40	"	300
50	"	250
75	"	150
100	300	110
150	170	70
200	120	50
300	70	30
500	30	20

Current limiting shall be achieved by a mechanism that fails to a safe state.The impedance of a voltage source may be increased by the use of a resistor provided it is of the type unlikely to become low resistance due to deterioration.

7.8 Normal High Voltages

The terminal may contain non-current-limited sources (eg power supplies) up to a maximum of V subject only to the requirements of 7.5. V is defined as the dc or peak ac value of the highest such source.Any higher voltage (eg EHT) must be protected as 7.9.

7.9 Extra High Voltages

All components,terminations and conductors carrying high (>V volts),non-current-limited (see 7.7) voltages shall be sufficiently insulated and segregated from the barrier such that there can be no accidental establishment of a conducting path between the high voltage points and the barrier components,either by direct mechanical contact or by fortuitous paths established under fault conditions.

7.10 Attachment of Private Equipment to Post Office Maintained Plant All private equipment intended for connection to Post Office maintained plant must first be evaluated by the Post Office to ensure

that it conforms to the requirements of this Specification and the specific related Technical Guides to which it refers. Under the terms of the Post Office Telecommunication Scheme 1976 made under section 28 of the Post Office Act 1969 each subscriber requires the written consent of the Post Office before any private attachment is connected to his installation. Such written consent brings the private equipment within the ambit of the General Licence for Private Attachments to Post Office Telecommunication Installation if their use would otherwise infringe the exclusive privilege of the Post Office to run telecommunication systems. Applications by suppliers for the evaluation of their equipment should be made in the first instance to:

Post Office Telecommunications Headquarters
Service Department
THQ/Sv1.1.3
Tenter House
Moorfields
LONDON
EC2Y 9TH

Charges will be raised for the evaluation of attachments and will vary with the amount of Post Office resources required; they will normally range from 50 to 950 pounds (plus VAT). In particularly complex cases, however, a specially assessed charge exceeding 950 pounds may be made. Applicants will be notified of the charge following receipt of the application. Evaluation will not commence until a form of undertaking accepting the charge has been signed and returned to the Post Office. The full charge will be payable whether or not the device is found to be technically acceptable. A charge will be payable if an application is withdrawn at any stage subsequent to the acceptance of the charge. It should be noted that payment will not necessarily ensure PO consent to the use of the equipment in question. Basic charges allow for a limited degree of retesting after new attachments have been modified during the evaluation stage. It will nevertheless be in the interest of the applicants to ensure that equipment is likely to meet PO requirements before being submitted for evaluation; significant periods of prior consultation will however be taken into account when individual charges are assessed. When an attachment has been found technically acceptable the Post Office proceeds in one of two ways. If the attachment is to be generally available the Post Office will either take a formal agreement with the supplier or require the acceptance of certain terms and conditions in which cases customers requests for connection of the equipment can be dealt with by the local Post Office staff. If the private equipment is unique or falls within certain limited categories each application to connect it to Post Office plant will be dealt with by Telecommunications Headquarters. The Post Office will only enter into such arrangements etc with Suppliers who have a registered place of business in the United Kingdom. Once evaluated no private equipment may be modified in any way from the model submitted for evaluation unless the Post Office agrees in writing to such modification. If any other company wishes to supply the same attachment it must make a separate application to the Post Office. The Post Office will accept no responsibility for the satisfactory performance of an attachment, nor for the effects of errors or failures that may occur during the transmission or reception of signals conveyed by the attachment. The

Post Office reserves the right to modify these requirements at any time and to require that modifications are made to already permissible private attachments. If such modifications require futher evaluation, charges may be raised.

7.11 Post Office Plans and Policy

The Post Office's policy on the provision of terminal equipment is set out in Appendix 4. It is intended to provide whatever computer services appear to be required by the customer with the exclusion of those services which are better served by specialist computing organisations.Development of message forwarding services is expected to proceed rapidly as the user population expands. This may require terminals capable of answering calls and receiving and storing messages from the computer. Specialist terminals may also be required for back-to-back working, e.g. for the deaf. Terminals capable of intelligent editing may also be required by Information Providers for maintaining the database.

Any enquiries concerning this specification are to be addressed to

Mr A S L Crammond
Post Office Research Centre
Martlesham Heath
Ipswich
IP5 7RE

IPSWICH (0473) 642581
TELEX 987621

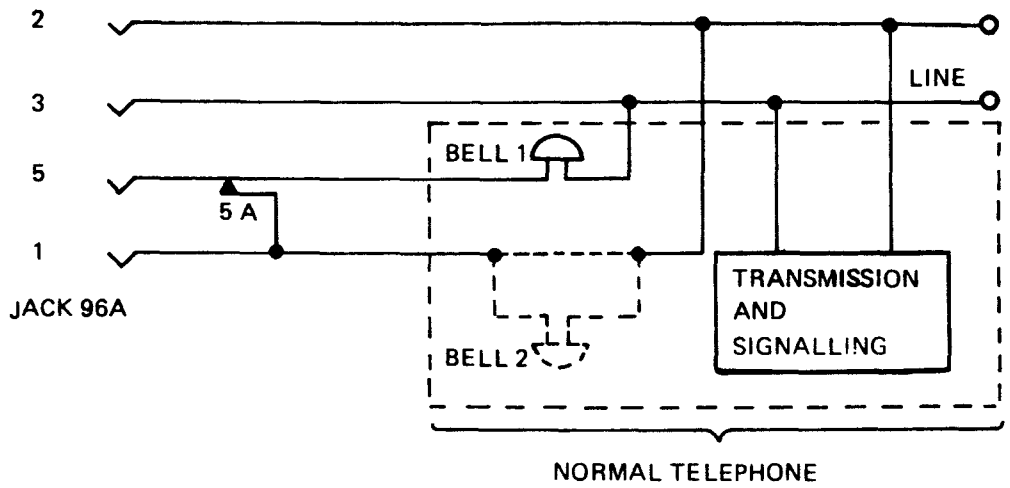


FIG. 1 TELEPHONE CONNECTION FOR CERTAIN CASES

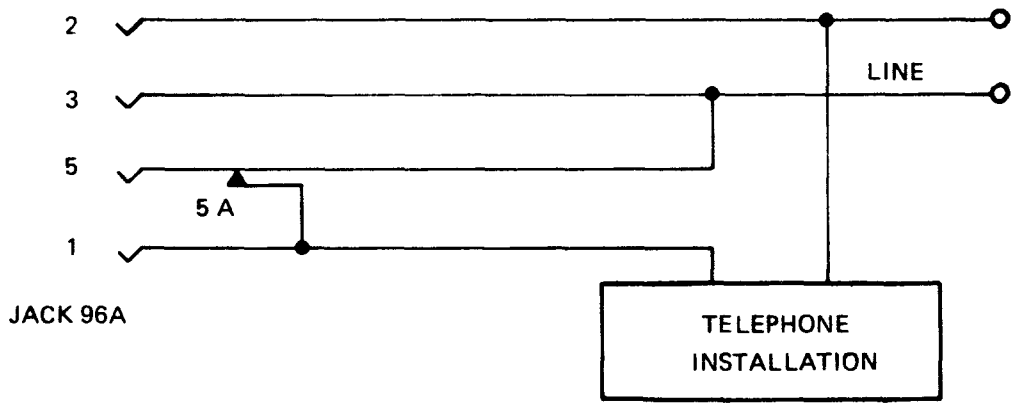


FIG. 2 NORMAL CONNECTION TO TELEPHONE SYSTEM

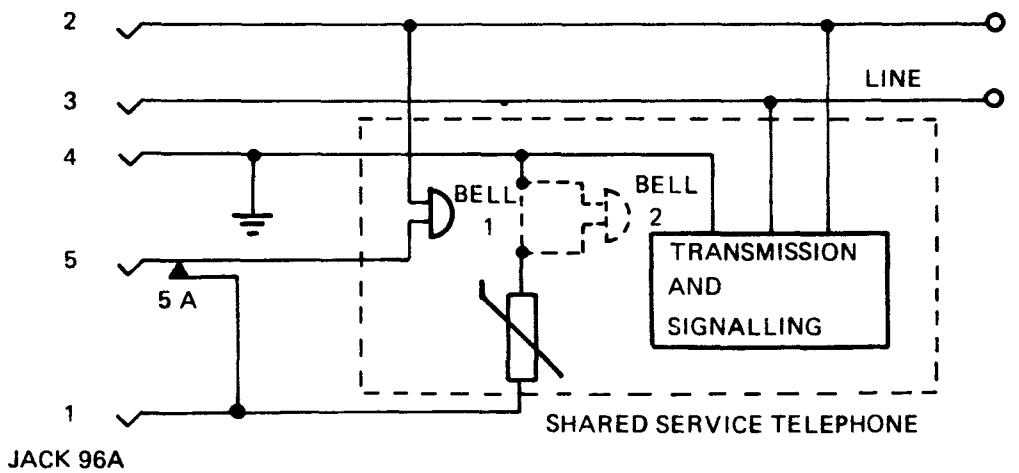


FIG.3 SHARED SERVICE CONNECTION

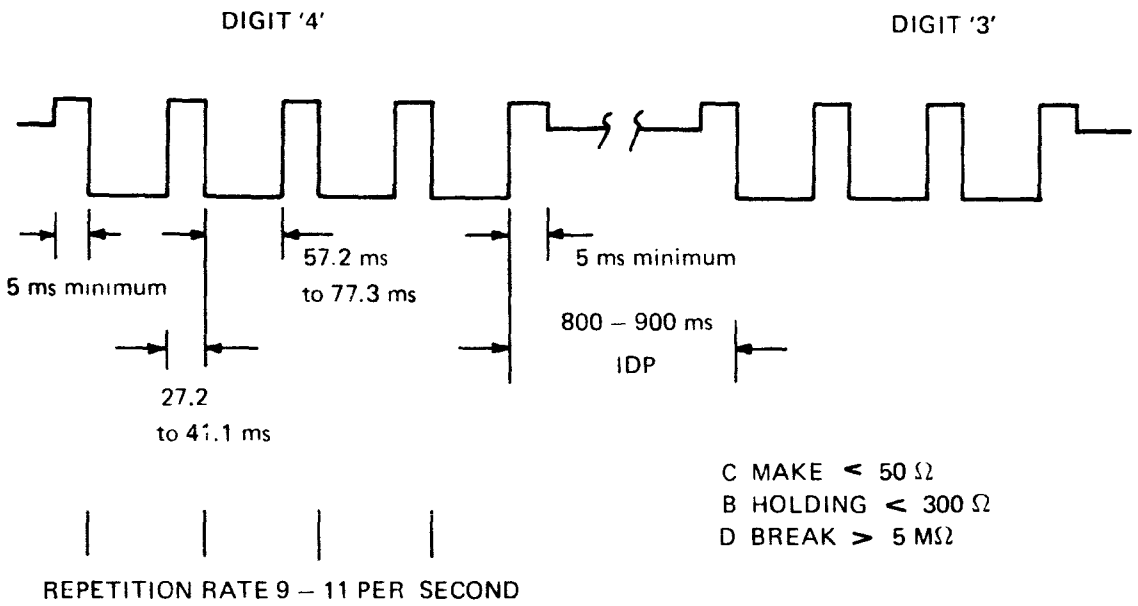
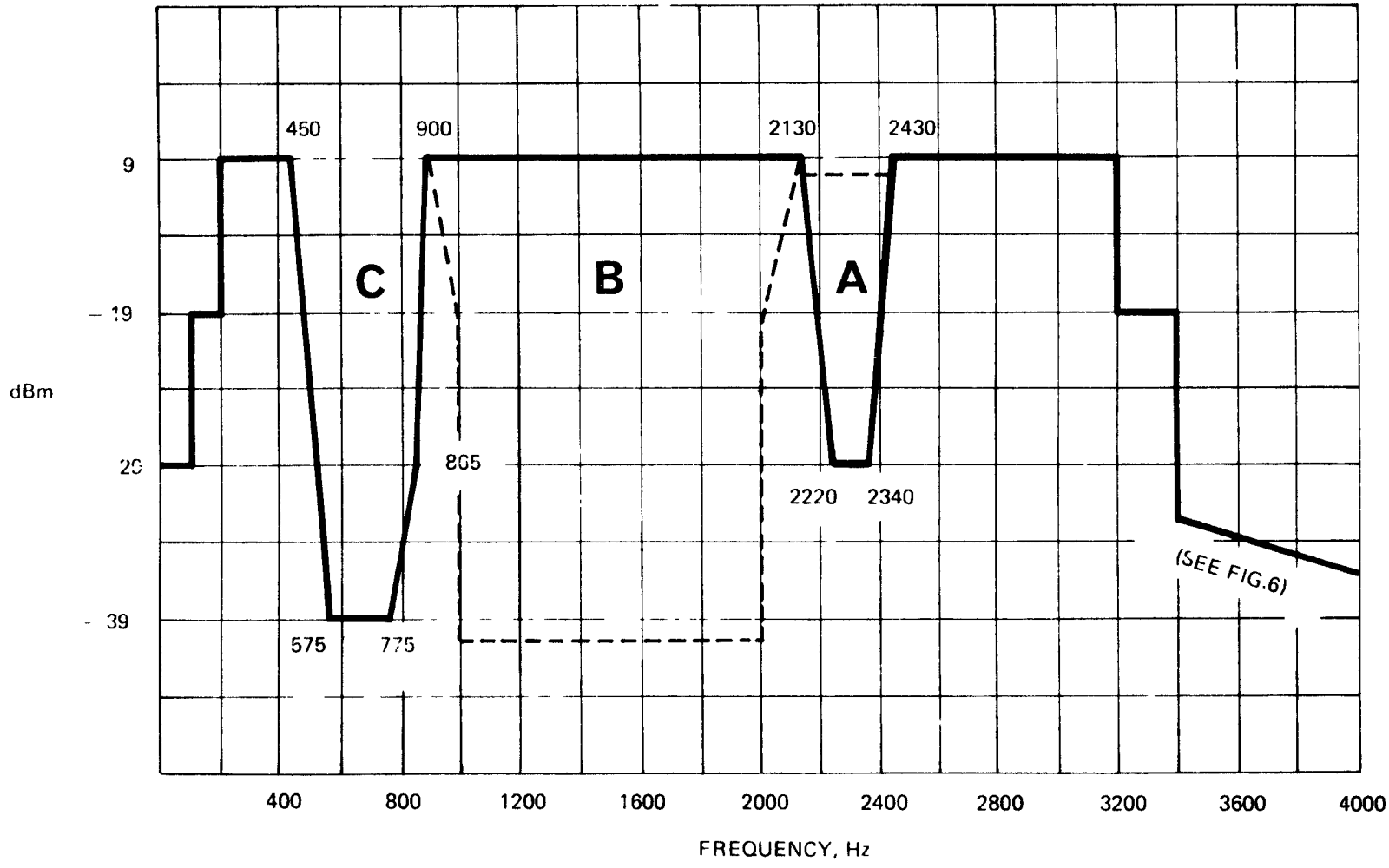


FIG.4 AUTODIALLING



Notes: (1) Signals are permitted in Area A only if accompanied by signals in Area B at a power level not lower than 12 dB below the power level of the signal in Area A.

(2) Signals are permitted in Area C provided that there is no false operation of trunk signalling equipment (SSAC 1).

FIG.5 MAXIMUM ONE - MINUTE - MEAN POWER LEVEL OF INDIVIDUAL SPECTRAL COMPONENTS OF THE OUTPUT SIGNAL FROM APPARATUS CONNECTED TO THE PUBLIC SWITCHED TELEPHONE NETWORK

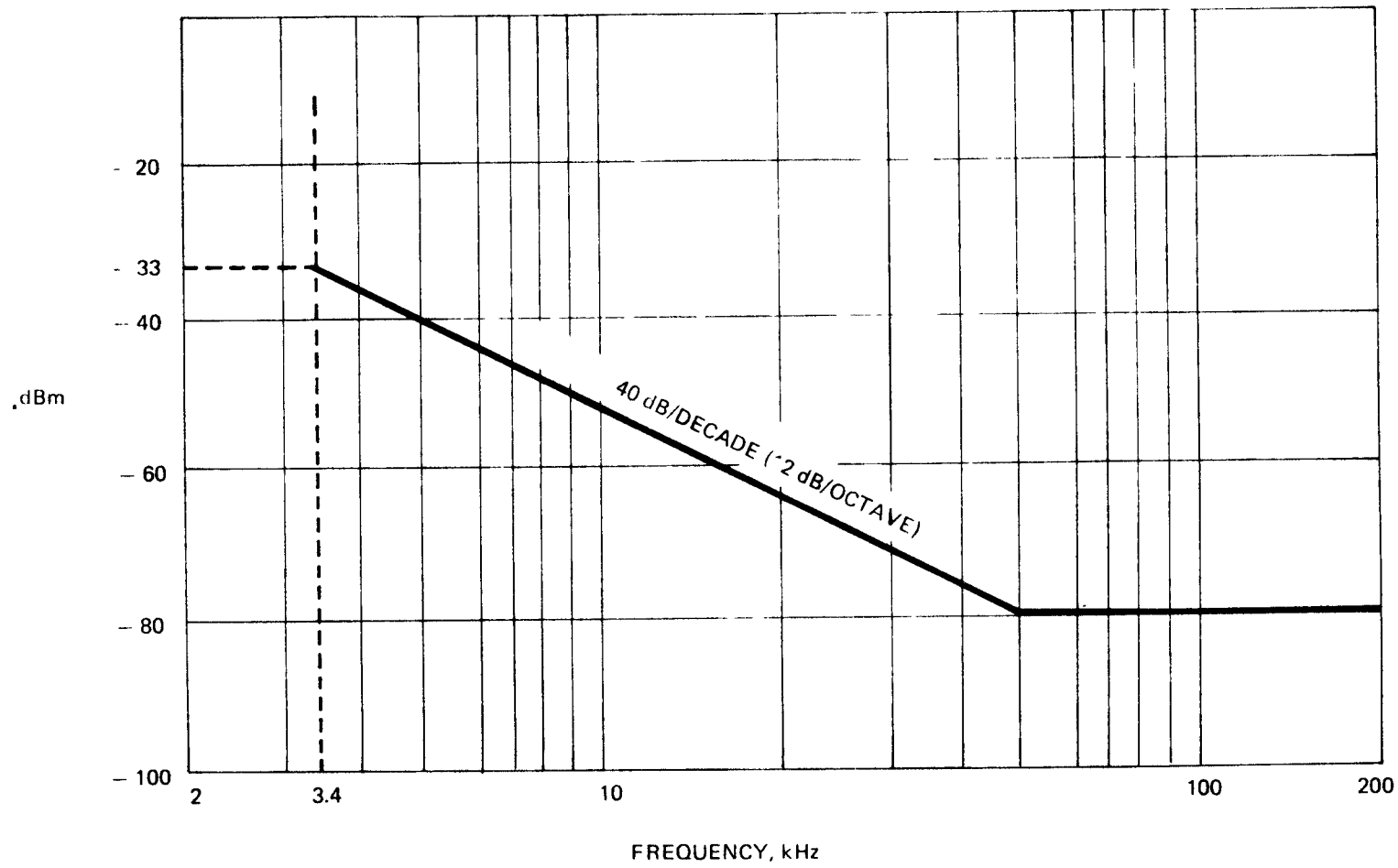


FIG.6 MAXIMUM POWER LEVEL OF INDIVIDUAL SPECTRAL COMPONENTS ABOVE 3.4 kHz OF THE OUTPUT SIGNAL FROM APPARATUS CONNECTED TO VOICE BAND CIRCUITS

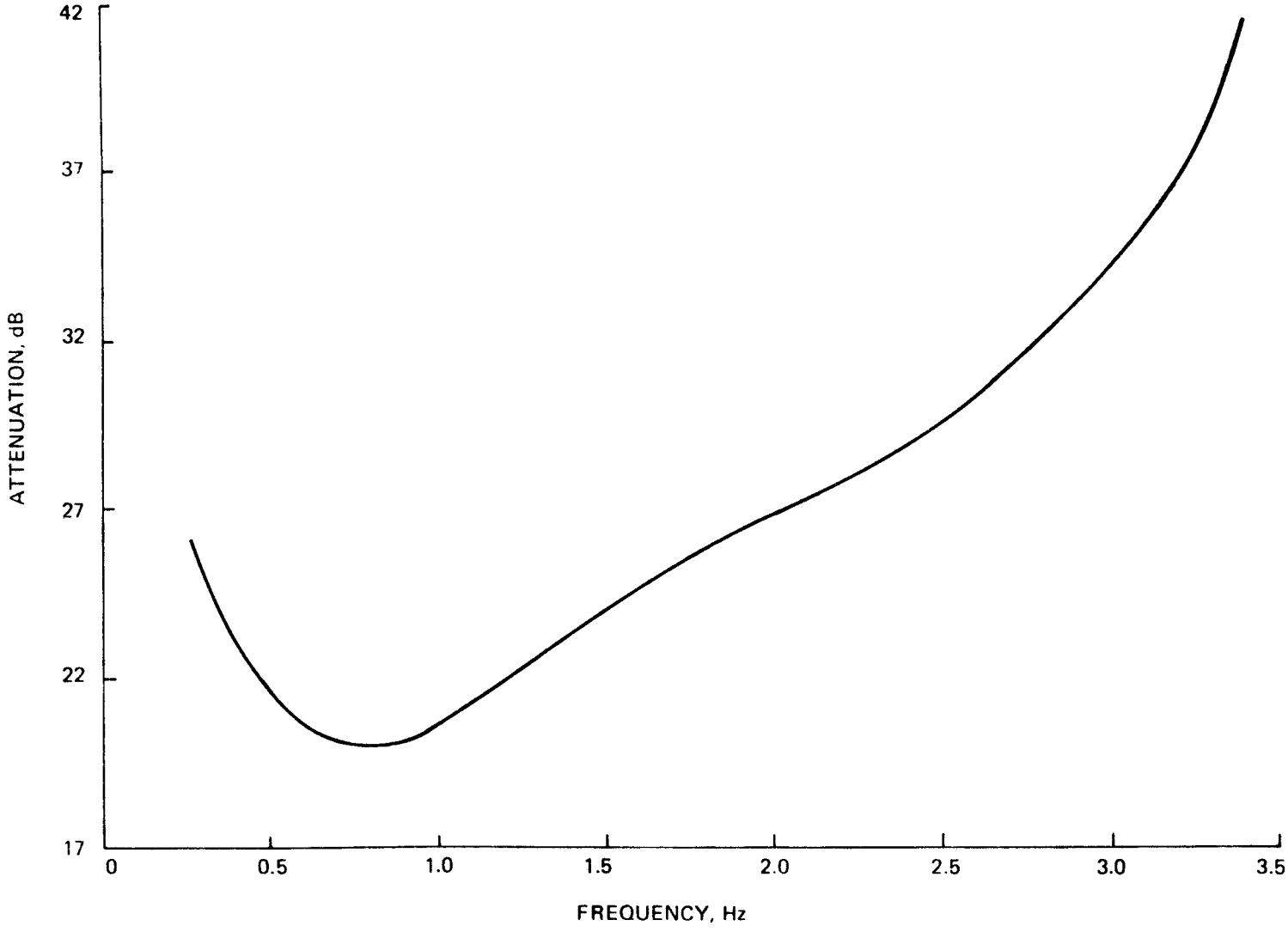


FIG.7 EXPECTED WORST CASE ATTENUATION

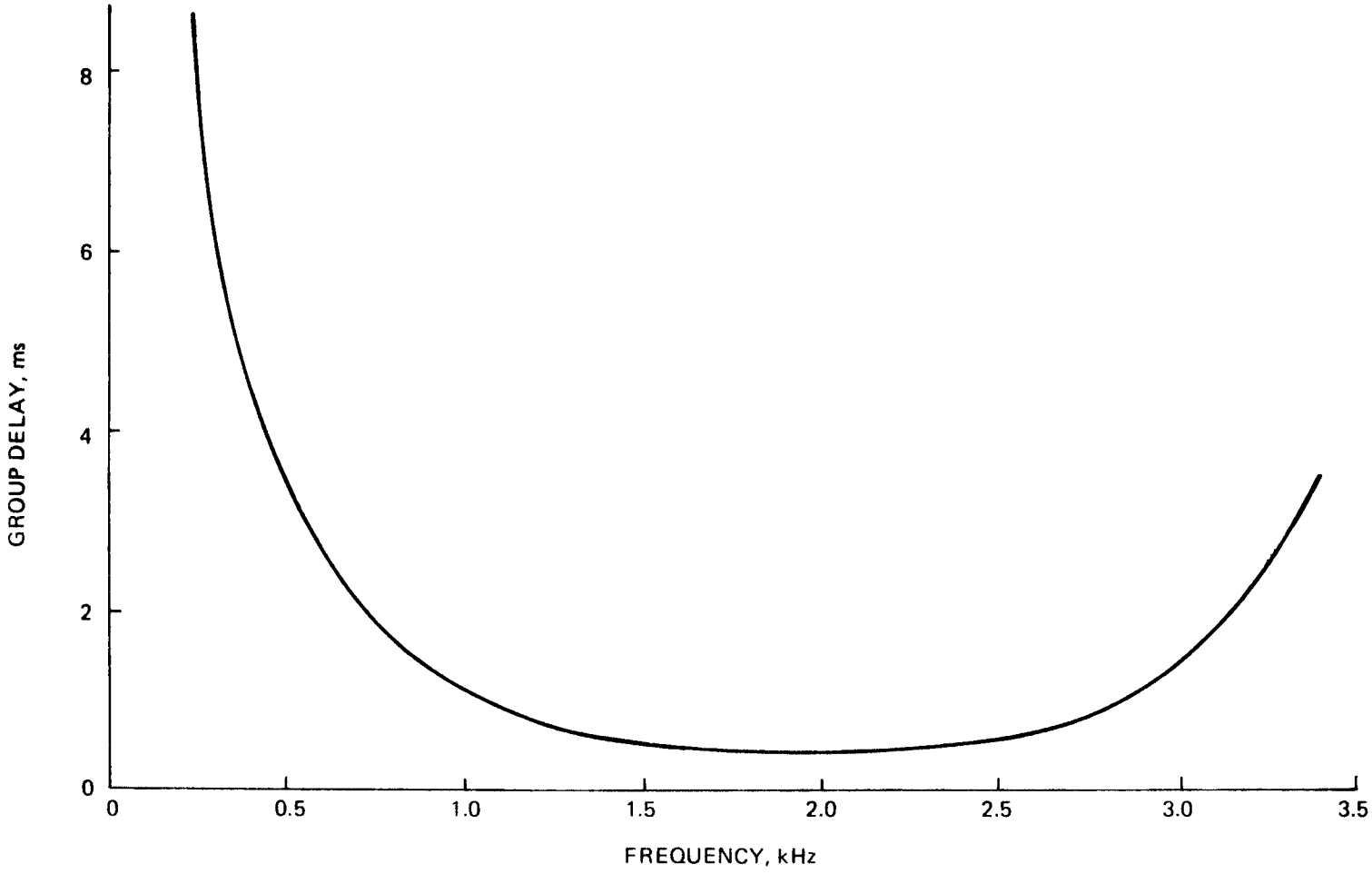


FIG.8 EXPECTED WORST CASE GROUP DELAY

	b_7	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	b_6	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
bit/s	b_5	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
$b_7b_6b_5b_4b_3b_2b_1$	Row / Col	0	1	2	2a	3	3a	3b	4	4b	5	5b	6	6a	7	7a					
0 0 0 0	0	NUL		Sp		0			@		P		–		p						
0 0 0 1	1		Cursor DC1 On	!		1		Set Verify Mode(1)	A	Alpha^n Red	Q	Graphics Red	a		q						
0 0 1 0	2	STX	DC2	"		2		Set Verify (2)	B	Alpha^n Green	R	Graphics Green	b		r						
0 0 1 1	3	ETX	DC3	£		3		Set Verify (3)	C	Alpha^n Yellow	S	Graphics Yellow	c		s						
0 1 0 0	4		Cursor DC4 Off	$		4		Set Programme Mode	D	Alpha^n Blue	T	Graphics Blue	d		t						
0 1 0 1	5	ENQ	NAK	%		5		Tape Pause on Playback	E	Alpha^n Magenta	U	Graphics Magenta	e		u						
0 1 1 0	6	ACK		&		6		Tape Start	F	Alpha^n Cyan	V	Graphics Cyan	f		v						
0 1 1 1	7			'		7		Tape Stop	G	Alpha^n White	W	Graphics White	g		w						
1 0 0 0	8	Cursor ← BS	CAN	(		8			H	Flash	X	Conseal Display	h		x						
1 0 0 1	9	Cursor → HT		)		9			I	Steady	Y	Contig Graphics	i		y						
1 0 1 0	10	Cursor ↓ LF		*		:			J		Z	Separated Graphics	j		z						
1 0 1 1	11	Cursor ↑ VT	ESC	+		;			K		←		k		¼						
1 1 0 0	12	Cursor Home & Clear FF	SS2	,		<			L	Normal Height	½	Black Background	l		ll						
1 1 0 1	13	Cursor ⇐ CR	SS3	—		-			M	Double Height	→	New Background	m		¾						
1 1 1 0	14	SO	Cursor RS Home	.		>			N		↑	Hold Graphics	n		÷						
1 1 1 1	15	SI		/		?			O		#	Release Graphics	o								

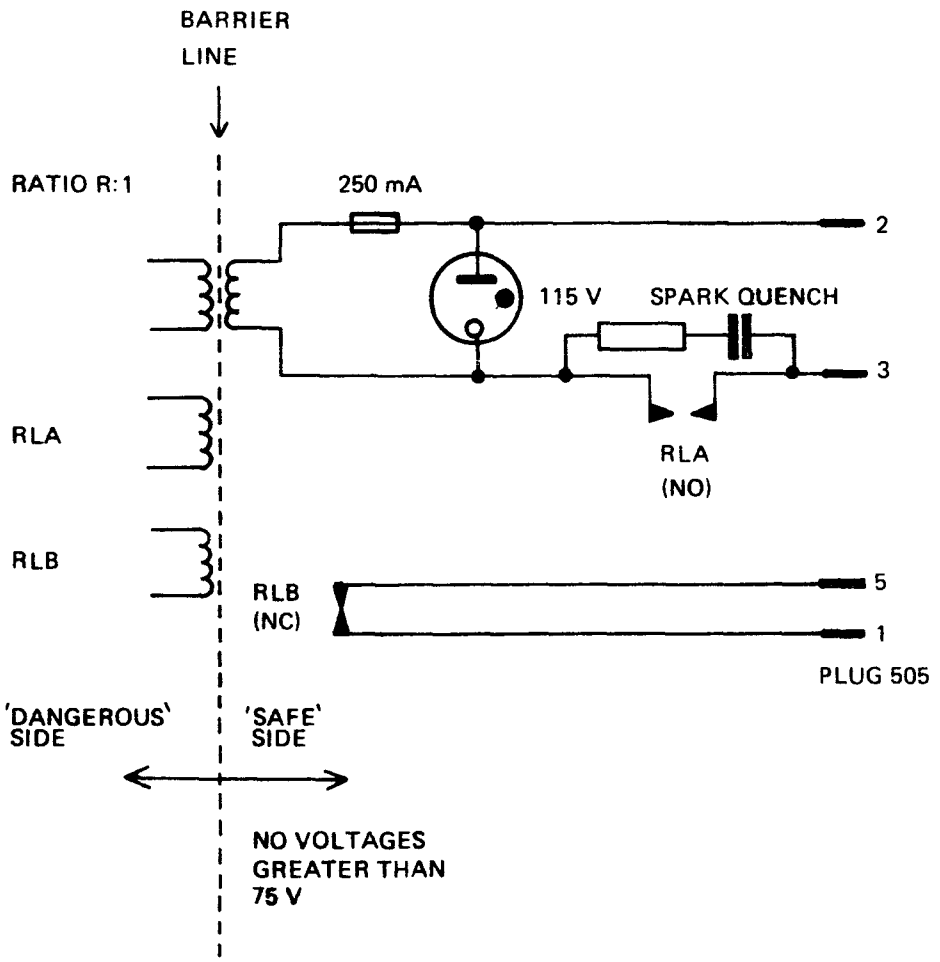
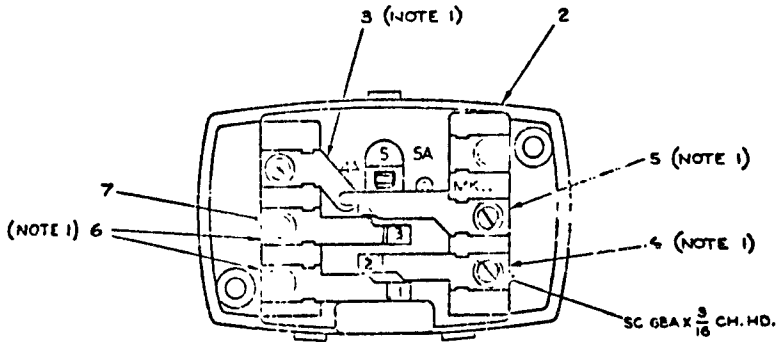
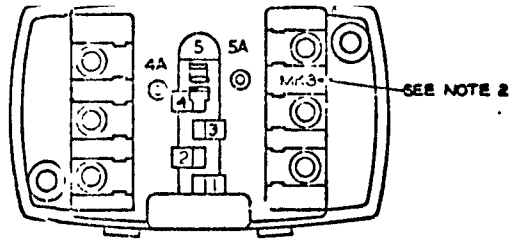


FIG. 10 SAFETY REQUIREMENTS



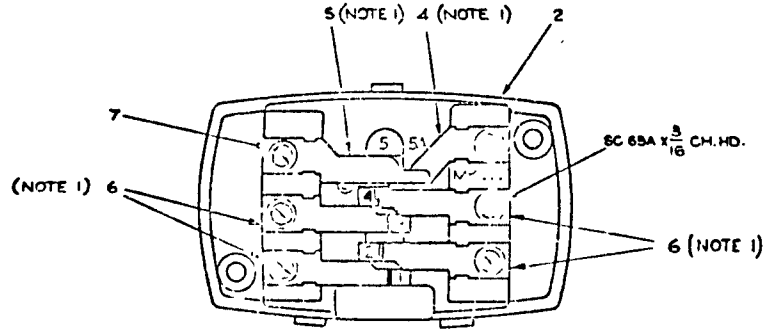
SPRING POSITIONS FOR JACK 95A (MK...)



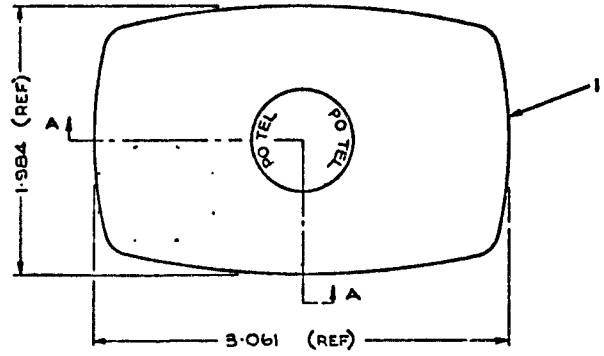
VIEW WITH COVER & CONTACT SPRINGS REMOVED

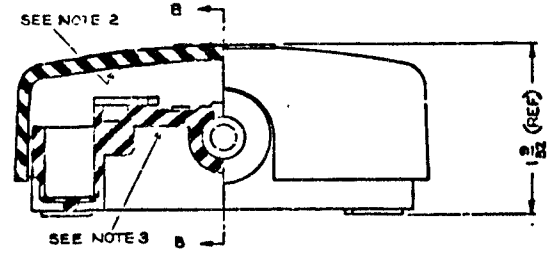
NOTES:-

1. ITEMS 3 TO 6 TO BE FIRMLY SECURED IN ITEM 2 BY AN APPROVED METHOD
2. MK 3 (TYPICAL MANUFACTURERS MK NO) IN CONTRASTING COLOUR
3. 95A FHB 93/3 (TYPICAL MARKING) SEE SPECS DIOOO & D2532
4. TO BE SUPPLIED PACKED IN A TRANSPARANT BUBBLE PACK CONTAINING A PAPER LABEL e.g. TO REMOVE COVER SQUEEZE SHORT SIDES & LIFT

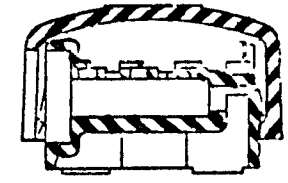


SPRING POSITIONS FOR JACK 96A (MK...)





SECTION A-A
CONTACT SPRINGS OMITTED



SECTION B-B
CONTACT SPRINGS OMITTED

SCHEDULE							
ITEM	PART	DRG	No OFF 95A	No OFF 96A	SCREWS ETC	FINISH	No OFF
1	[illegible]	D[illegible]7761	1	1			
2	[illegible]	D[illegible]/30	1	1			
3	[illegible]	D[illegible]/2091	1	–			
4	[illegible]	D[illegible]/2092	–	1			
5	[illegible]	D[illegible]/2093	1	1	SC 6BA X 5/16 CH HD	NIP&PASS	6
6	[illegible]	D[illegible]/2094	3	4			
7	[illegible]	DMM/83	5	6			

USED WITH PLUGS NO 420/505 MK 1 (SOL) (DRGS 90842, 91571)

APPENDIX 1

DIMENSIONS IN INCHES
ORIGINAL SCALE 2:1 UNLESS OTHERWISE STATED

A1 A2	CKD [illegible]	FORMERLY DRG. CD2560 [illegible] 3-3-76		MATERIAL —	FINISH —
	CERTIFICATION [illegible]	NOTE 4 & 5 ADDED DET Z & SECTION C-C DELETED CHANGES TO MARKING [illegible] 18-6-79		JACKS No 95A & 96A COLOUR (MK 2 ONWARDS)	
	12 4 73	AMENDMENT	55-51	POST OFFICE TELECOMMUNICATIONS HQ TD ILL 4	93636

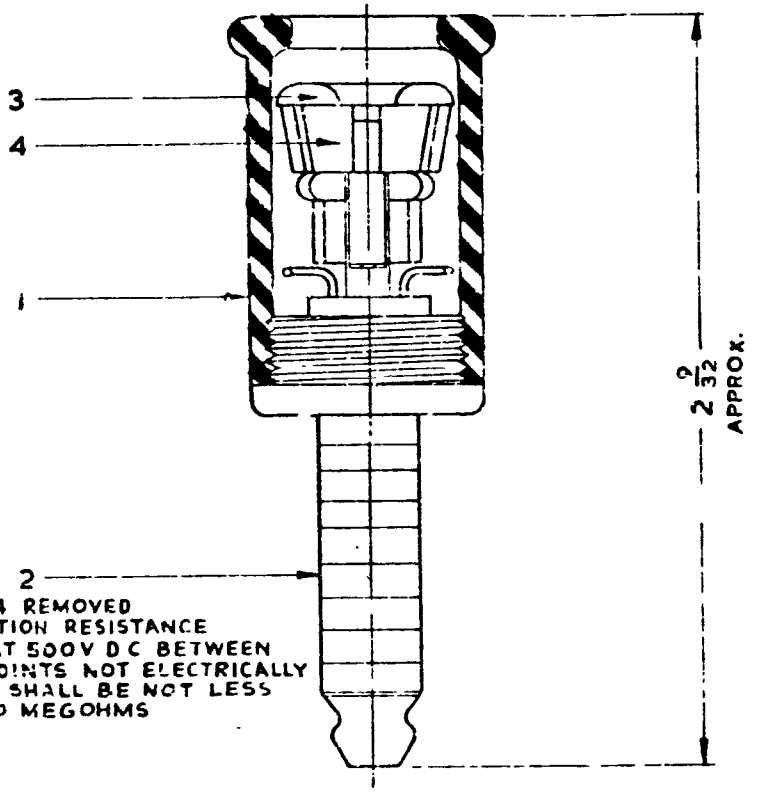
SEE [illegible] FILE S.[illegible]/95A
SPEC D 1000, D2532
SEE SCHEDULE

APPENDIX 2

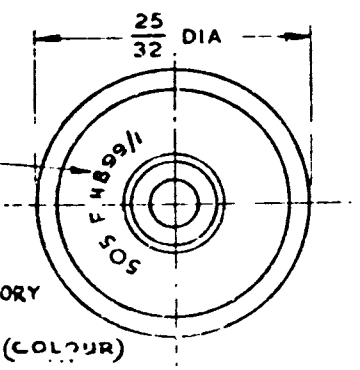
POST OFFICE ENGINEERING DEPT
S BRANCH

DRG 91571

PLUG No.505(COL)
(MARK 1)
ASSEMBLY



WITH ITEM 4 REMOVED
THE INSULATION RESISTANCE
MEASURED AT 500V D C BETWEEN
ANY TWO POINTS NOT ELECTRICALLY
CONNECTED SHALL BE NOT LESS
THAN 1000 MEGOHMS



COLOURS :- BLACK, GREY & IVORY

FOR USE WITH JACK No.96A(COLOUR)
(DRG. 91497)

SCHEDULE			
ITEM	PART	DRAWING	No.OFF
1	Ø 1/DCO/60 (COLOUR) (COVER, PLUG)	DCO/60	1
2	1/DPL/400 (PLUG, ASSEMBLY)	DPL/400	1
3	Ø 1/DRI/27 (RING, THRUST)	DRI/27	1
4	Ø 1/DSP/3013 (SPACER, PLUG)	DSP/30.3	1

Ø REPLACEABLE ITEMS

PX
CAT. 13246

DRG 91571

DIMENSIONS IN INCHES

LIMIT OF DRAWING SPACE

APPENDIX 3
Standard Tones on the Public Switched Telephone Network

Number unobtainable tone		400Hz continuous	
Engaged Tone		400Hz interrupted	0.75s on 0.75s off
	or	400Hz interrupted	0.375s on 0.375s off
Pay Tone		400Hz interrupted	0.125s on 0.125s off
Ringing Tone		400Hz or 400+450Hz modulated by 50,25 or 17Hz and interrupted	0.4s on 0.2s off 0.4s on 2.0s off
Equipment Engaged Tone		400Hz interrupted	0.4s on 0.35s off 0.225s on 0.525s off

*The 0.4s tone period is 6dB below the level of the 0.255 s period.

Dial tone. 50 or 33 1/3 Hz with high order harmonics. The frequencies quoted may vary over the range +5% to -13% and the tones may contain high-order harmonics due to the variation of waveform from sinusoidal to almost square-wave. Periodicities may vary +5% except Pay Tone which may vary in periodicity by +33% to -20%.

APPENDIX 4

PROVISION OF VIEWDATA RECEIVERS: PAPER BY POST OFFICE FOR VIEWDATA LIAISON GROUP

This paper sets out the present Post Office policy on the provision of Viewdata receivers, and defines in more detail the general position established in Sir Edward Fennessy's letter of 22nd March 1977 to BREMA.

The policy applies only to Viewdata, and is subject to review in the light of experience as the Viewdata project progresses.

Role of the Post Office

The Post Office intends to enter the market for business Viewdata receivers, and subject to the continued successful progress of the Viewdata project the Post Office hopes to start offering such apparatus to its customers in mid-1979.

The initial offering may take the form of an adaptor, to be associate with a separate TV receiver; later, the Post Office envisages providing a complete 'viewdataphone' incorporating a telephone instrument.

Role of the private sector

The Post Office has decided that it is reasonable to allow the privat sector to provide directly to customers, as attachments to the public switched telephone network, TV receivers equipped to receive Viewdata provided that:

a. The apparatus is capable of receiving TV programmes.
b. The apparatus does not incorporate a telephone instrument.
c. The apparatus meets the Post Office's normal technical and safety procedures for attachment approval.
d. The apparatus conforms to the technical specifications laid down by the Post Office for inter-working with a Post Office Viewdata computer centre.

Provided that the privately-provided apparatus meets these requirements, it may:

a. Be monochrome or colour, large or small screen, with numeric or alpha-numeric keys, with or without Ceefax/Oracle, be in the form of a single unit or a TV set with adaptor, and be used in any type of premises.
b. Incorporate within it the electronic equipment required to modulate and demodulate the signals on the telephone line, to identif the customer terminal, and to decode and display the Viewdata information.
c. Incorporate within it the electronics necessary to establish connections automatically to up to 4 computer centre access numbers, at least two of which should be Post Office Viewdata computer centres

Post Office

October 17th 1977

EM SPECIFICATION

the absence of a received line signal the modem shall not transmit spurious data to terminal logic. Absence of carrier is defined as a received signal level of less n -53dBm for more than 600 ms. Presence of carrier shall be a signal of more than dBm for more than 600 ms.

System of Modulation	:	Frequency-shift keying (FSK)
Transmit Channel	:	
Characteristic Frequencies	:	Binary 0: 450Hz ± 5Hz Binary 1: 390Hz ± 5Hz
Data Rate	:	up to 75 bits per second
Output Level	:	between -17dBm and -11dBm in 600Ω resistive termination.
Isochronous distortion	:	10% maximum at 75 bit/s measured at output of a PO modem over range of receive levels -20 to -43dBm.
Spurious emissions	:	When the LTU is transmitting continuous binary 0 or binary 1, the power of the spurious emissions within the band 300Hz to 3400Hz shall be more than 30dB lower than the mean output power level. Under modulation conditions with any data pattern the total power of the spurious and harmonic emissions in the range 600 to 3400Hz shall be more than 30dB lower than the mean output power. The maximum power level transmitted above 3.4KHz shall not exceed the levels indicated in Fig 6 in the main specification.
Receive Channel	:	
Characteristic Frequencies	:	Binary 0: 2100Hz ± 16Hz Binary 1: 1300Hz ± 16Hz
Data Rate	:	1200 bits per second
Input level	:	-13 to -40dBm measured in a 600Ω resistive termination.
Isochronous distortion	:	35% maximum with above range of levels from a PO modem.

RALL PERFORMANCE

Impedance	:	The input impedance presented to the two-wire line shall be as follows:- At d.c. $R \leqslant 330\Omega$ At frequencies between 300 and 3400Hz $Z_{in} = 600\Omega$ balanced and d.c. isolated (refer to section 7) Return loss: $\geqslant$ 20dB at 800Hz $\geqslant$ 15dB elsewhere in the above band

DC short circuit
current available
from line : 20 - 140 mA

Error rate performance :

The error rate performance testing shall be carried out in conjunction with a calibrated PO modem by the method shown in Fig5/1. The white gaussian noise shall have a minimum bandwidth of 200Hz - 10KHz and a minimum crest factor of 5. The test networks are defined as follows:-

Test Network A This simulates the attenuation and group delay distortion of a subscriber's line and 2 carrier links in tandem apart from flat loss which is taken into account by attenuator Y.

Test Network B This simulates the attenuation and group delay distortion of a subscriber's line and 25 miles of loaded cable in tandem apart from flat loss which is taken into account by attenuator Y.

Test Network C This simulates a 4dB return loss to the LTU.

The precise specification of these test networks and a calibrated PO Modem to be used in the above test, shall be made available to the contractor.

Test Procedure

Receive Channel

With the Datel Modem 1 transmitting a 511- bit pseudo-random sequence at 1200 bit/s and the modem under test replaced by a resistive 600 Ω termination, carry out the following operations:-

i Set all switches to position 1
ii Set Attenuator Y to 0dB
iii Adjust Attenuator X, to give a reading of -13.5 ± 0.5dBm on the rms voltmeter.
iv Set Attenuator W to 0dB. Set SW3 to position 3. Adjust the output level of the noise generator to produce the same reading on the voltmeter as in step (iii).
v Set SW3 to position 2. Then for any setting of attenuator W the ratio of (signal power)/(noise power/Hz) is given by the expression ($Z + 10 \log_{10} B$) dB, where Z is the setting of Attenuator W and B is the noise bandwidth of the noise source in Hz.
vi Set SW5 to position 2 and modulate the 75 bit/s return channel with a 511- bit pseudo-random sequence. The performance of the modem under test shall be as indicated for 1200 bit/s in Table 2 using SW1, SW2 and SW4 to insert the networks A, B and C in the circuit.

Transmit Channel

Interchange the modem under test and the Datel Modem 1. With the modem under test transmitting a 511- bit pseudo-random sequence at 75 bit/s, and the Modem 1 replaced by a 600 Ω termination, carry out the operations listed under 'Receive channel', checking that the received signal level is -29 ± 1dBm It will be necessary to set the signal to noise ratio by adjusting the noise level with Attenuator W set to (say) 10dB and subsequently reducing this setting to produce the figure required in Table 2.

The performance of the channel under test shall be as indicated for 75 bit/s i Table 2.

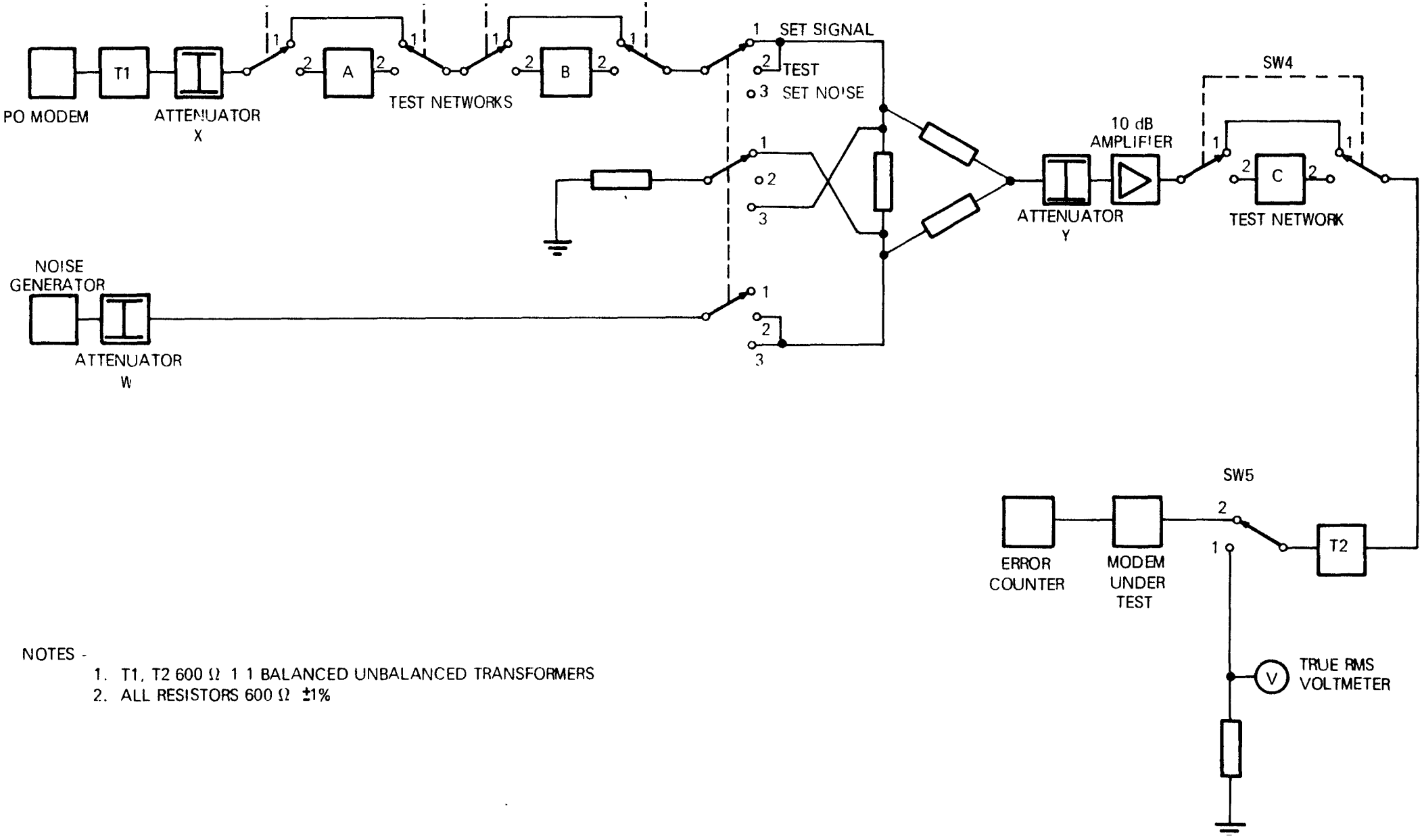
KEY TO SWITCH POSITIONS

SW1	Position 1	No distortion
	" 2	Network A
SW2	" 1	No distortion
	" 2	Network B
SW3	Position 1	Set signal
	" 2	Signal and noise
	" 3	Set Noise
SW4	Position 1	No distortion
	" 2	Network C
SW5	Position 1	Set levels
	" 2	Test Modem

TABLE 1

Attenuator Y setting (dB)	Test Networks in Circuit	At 1200 bit/s 10 errors in 10^6 bits	At 75 bit/s 10 errors in 10^5 bits
		(Signal power)/(Noise power/Hz) (dB)	
0	NONE	49	32
13	NONE	49	-
26	NONE	59	-
0	A	54	-
6	B	55	-
16	A+B	62	-
0	C	51	-
0	A+C	55	-
0	B+C	57	-
0	A+B+C	62	-

TABLE 2



NOTES -

1. T1, T2 600 Ω 1 1 BALANCED UNBALANCED TRANSFORMERS
2. ALL RESISTORS 600 Ω ±1%

VIEWDATA TEST NETWORKS

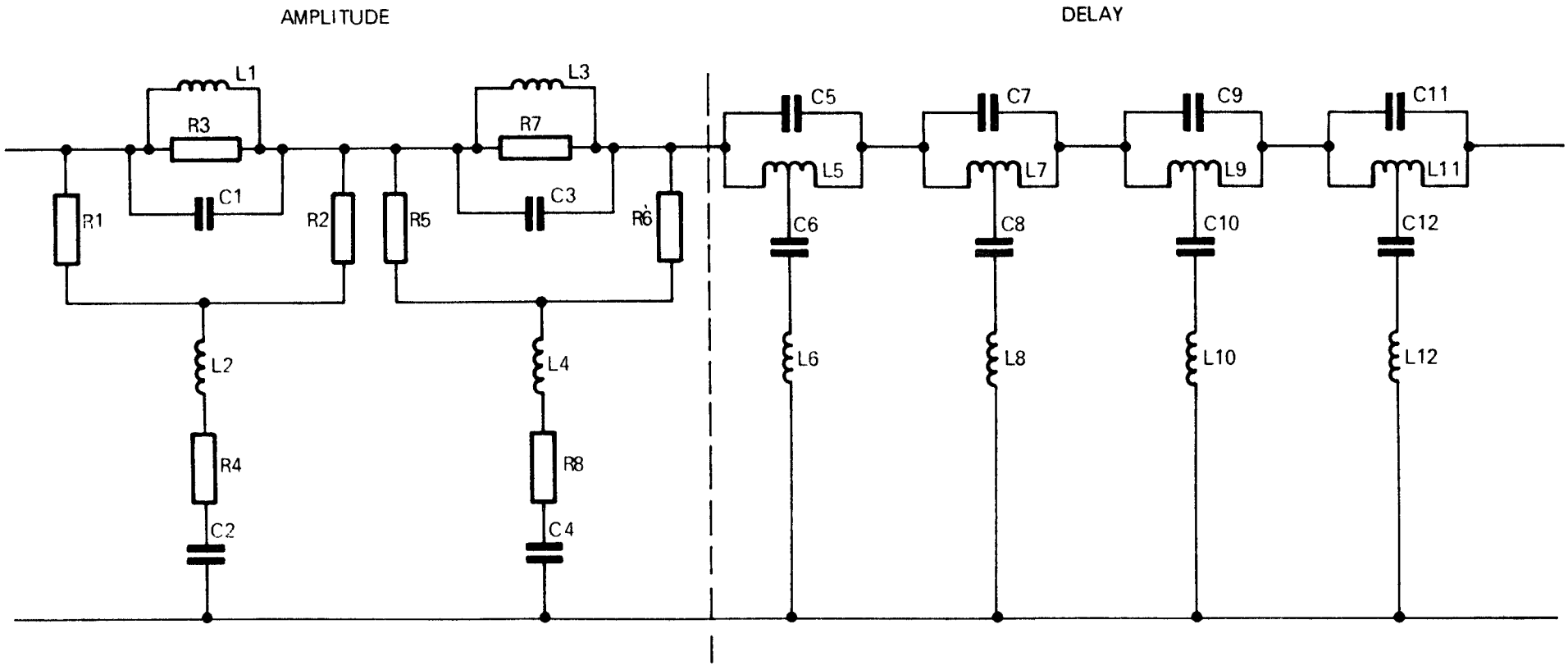
Networks A and B

Each of these contains a delay section and an amplitude section. The combined characteristics in each case are shown in tabulated and graphical form.

The flat loss required to bring the amplitude characteristics within the specification has not been associated with the networks, but is allowed for in the settings specified for Attenuator Y in Table 2 during the performance test procedure.

Network C

This is a resistive mismatch pad 600Ω to 2700Ω presenting a 4dB return loss at the Viewdata Modem line termination.



COMPONENT VALUES
TOLERANCE ALL RESISTORS AND CAPACITORS 1%

R1 = 600 Ω	R5 = 600 Ω	L5 = 0 574 H	L7 = 0 362 H	L9 = 8 7 mH	L11 = 20 2 mH
R2 = 600 Ω	R6 = 600 Ω	L6 = 0 125 H	L8 = 0 0413 H	L10 = 97 7 mH	L12 = 46.6 mH
R3 = 719 Ω	R7 = 2108 Ω	C5 = 0 346 μF	C7 = 0.115 μF	C9 = 0 27 μF	C11 = 0 13 μF
R4 = 501 Ω	R8 = 171 Ω	C6 = 1.6 μF	C8 = 1 μF	C10 = 24 2 nF	C12 = 56.1 μF
L1 = 358 mH	L3 = 17.0 mH				
L2 = 1.05 H	L4 = 36.1 mH				
C1 = 2.19 μF	C3 = 0 1 μF				
C2 = 0.99 μF	C4 = 4.72 nF				

NETWORK A

Winding Information

All coils are to be wound on Mullard Vinkor Type LA 1220 (25mm, μe 160), Adjuster Type LA1275. The turns/gauge information below is based on information published in the Mullard Technical Handbook, Book 3 Part 3, 'Ferrox cube Inductor Cores'. Th gauge of wire is chosen so as to provide a full bobbin and hence maximum 'Q'. The information is based on enamelled copper wire to BS4520 Part 1 (Grade 1 covering).

Inductance	Turns	Gauge (dia mm)	Gauge SWG (approx)
L1 358 mH	805	0.18	37
L2 1.05 H	1378	0.14	39
L3 17.0mH	175	0.4	27
L4 36.1mH	256	0.315	30
L5 0.574 H	1020	0.16	38
L6 0.125 H	475	0.25	33
L7 0.362 H	810	0.18	37
L8 0.0413H	273	0.315	30
L9 8.70mH	126	0.5	25
L10 97.7mH	421	0.25	33
L11 20.2mH	191	0.4	27
L12 46.6mH	290	0.315	30

Capacitors

High 'Q' polystyrene capacitors should be used. In cases where high values of capacitance are required polycarbonate or metallised polyester types may be used.

Setting Up

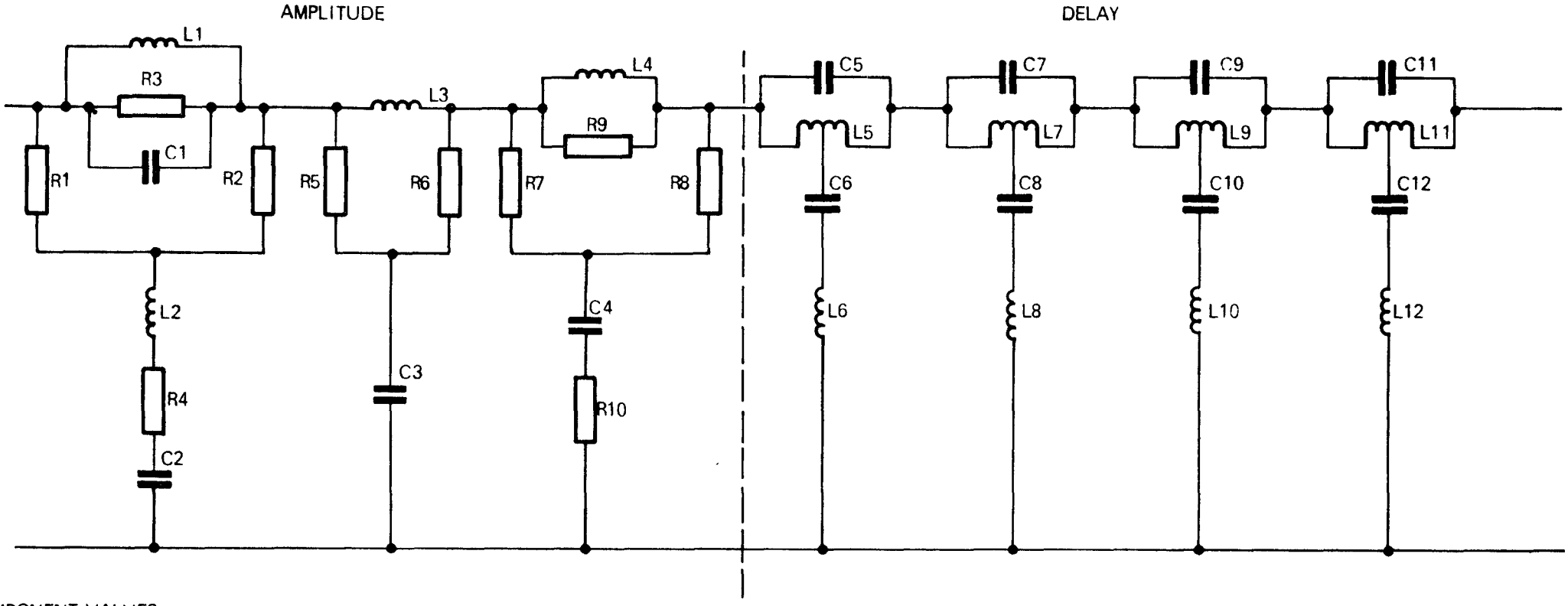
Delay Network

The delay network consists of 4 parallel LC branches and 4 series LC branches. The network is set up by separately tuning each branch. This is done by adjusting the inductor to give the resonant frequency below. These adjustments should be made wi the branches disconnected from each other.

Amplitude Network

The amplitude network contains 2 parallel RLC branches and 2 series RLC branches. The network is set up by separately tuning each branch. Again this is done by adju the inductor to give the resonant frequency below. The adjustments should be made with the branches disconnected from each other.

Branch	Series (S) or Parallel (p)	Resonant frequency (Hz)
L1 C1 R3	P	156
L2 R4 C2	S	156
L3 R7 C3	P	3860
L4 R8 C4	S	3860
C5 L5	P	357
C6 L6	S	357
C7 L7	P	781
C8 L8	S	781
C9 L9	P	3275
C10 L10	S	3275
C11 L11	P	3114
C12 L12	S	3114



COMPONENT VALUES
TOLERANCE. ALL RESISTORS AND CAPACITORS 1%

R1 = 600 Ω
R2 = 600 Ω
R3 = 7355 Ω
R4 = 49 Ω
L1 = 21.4 mH
L2 = 27.6 mH
C1 = 76.6 nF
C2 = 59.6 nF

R5 = 600 Ω
R6 = 600 Ω
L3 = 22.7 mH
C3 = 63.2 nF

R7 = 600 Ω
R8 = 600 Ω
R9 = 201 Ω
R10 = 1791 Ω
L4 = 0.126 H
C4 = 0.35 μF

L5 = 5 04 mH
L6 = 0.152 H
C5 = 0.423 μF
C6 = 14 nF

L7 = 22 mH
L8 = 38.7 mH
C7 = 0.108 μF
C8 = 61 2 nF

L9 = 30.8 mH
L10 = 29 mH
C9 = 80.6 nF
C10 = 85.4 nF

L11 = 39 mH
L12 = 17 mH
C11 = 47.2 nF
C12 = 0.109 μF

FIG. 5/3. NETWORK B. 600 Ω IMPEDANCE

NETWORK B

Winding Information

All coils are to be wound on Mullard Vinkor Type LA 1220 (25 mm, μe 160), adjuster Type LA 1275. The turns/gauge information below is based on information published in the Mullard Technical Handbook, Book 3, Part 3, "Ferroxcube Inductor Cores". The gauge of wire is chosen so as to provide a full bobbin and hence maximum "Q". The information is based on enamelled copper wire to BS 4520 Part 1 (Grade 1 covering).

Inductance		Turns	Gauge (dia mm)	Gauge SWG
L_1	21.4 mH	197	0.4	27
L_2	27.6 mH	223	0.355	29
L_3	22.7 mH	203	0.4	27
L_4	0.126 H	478	0.25	33
L_5	5.04 mH	96	0.56	24
L_6	0.152 H	525	0.224	34
L_7	22 mH	200	0.4	27
L_8	38.7 mH	265	0.315	30
L_9	30.8 mH	236	0.355	29
L_{10}	29 mH	229	0.355	29
L_{11}	39 mH	266	0.315	30
L_{12}	17 mH	175	0.4	27

Capacitors

High "Q" polystyrene capacitors should be used. In cases where high values of capacitance are required, polycarbonate or metallised polyester types may be used.

NETWORK B

Setting Up

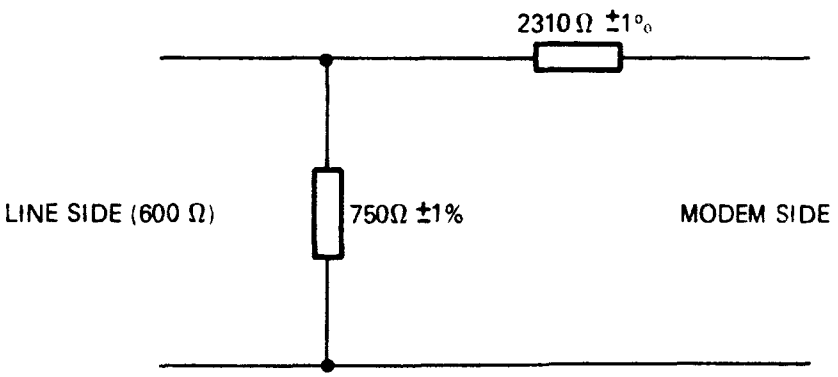
Delay Network

The delay network consists of four parallel LC branches and four series LC branch The network is set up by separately tuning each branch. This is done by adjustin the inductor to give the resonant frequency below. These adjustments should be m with the branches disconnected from each other.

Amplitude Network

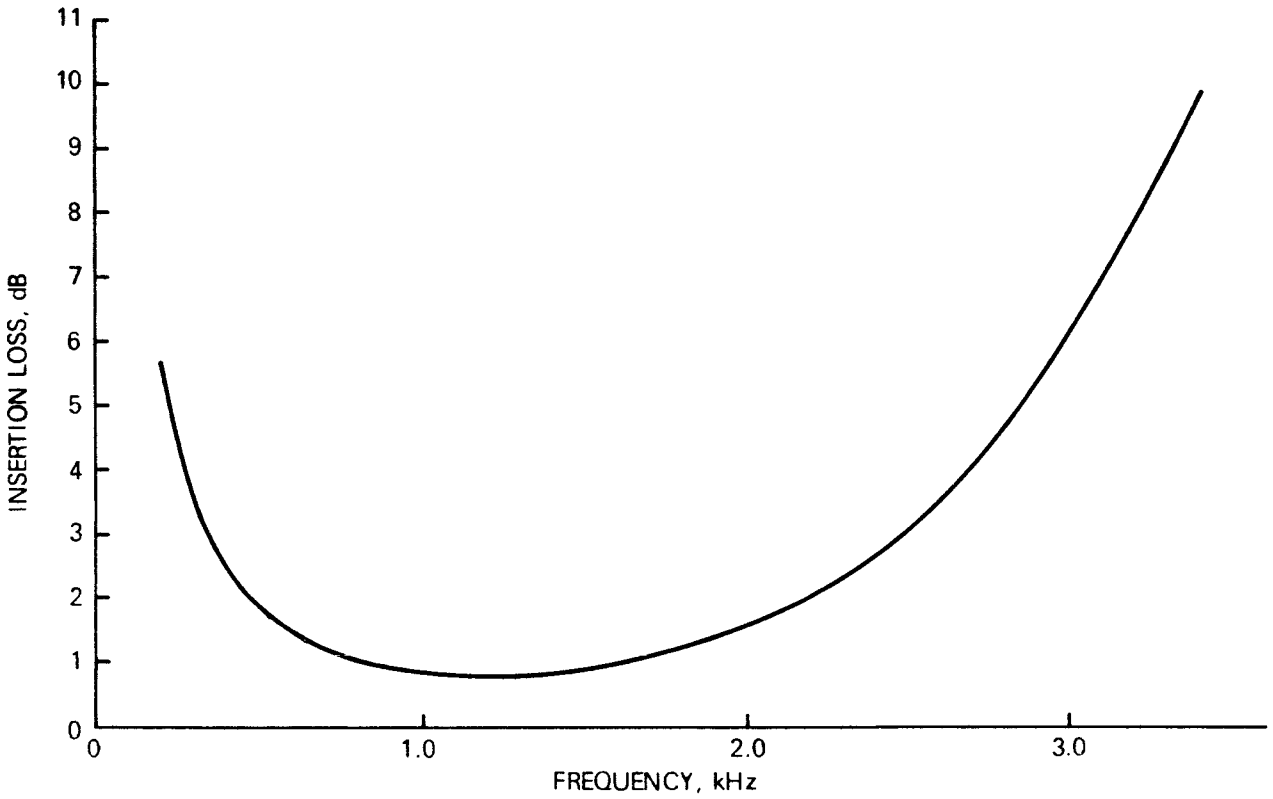
Only the first section requires adjustment. This contains a parallel RLC branch a series RLC branch. The branches are tuned to resonance by adjusting the induct The adjustments should be made with the branches disconnected from each other.

Branch	Series (S) or Parallel (P)	Resonant Frequency (H_z)
L_1 R_3 C_1	P	3927
L_2 R_4 C_2	S	3927
C_5 L_5	P	3449
C_6 L_6	S	3449
C_7 L_7	P	3270
C_8 L_8	S	3270
C_9 L_9	P	3196
C_{10} L_{10}	S	3196
C_{11} L_{11}	P	3701
C_{12} L_{12}	S	3701



RETURN LOSS ON MODEM SIDE = 4 dB
INSERTION LOSS = 14.2 dB

FIG. 5/4. NETWORK C



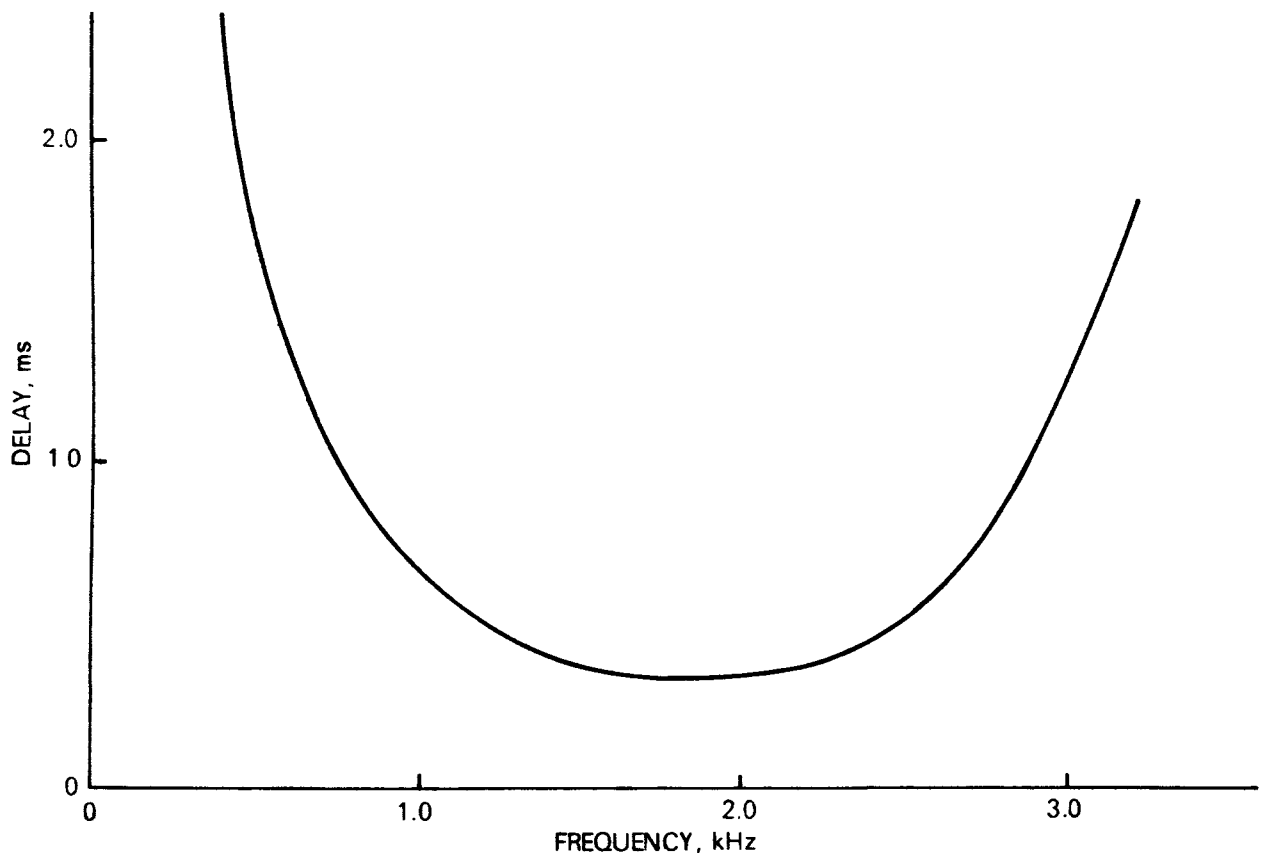
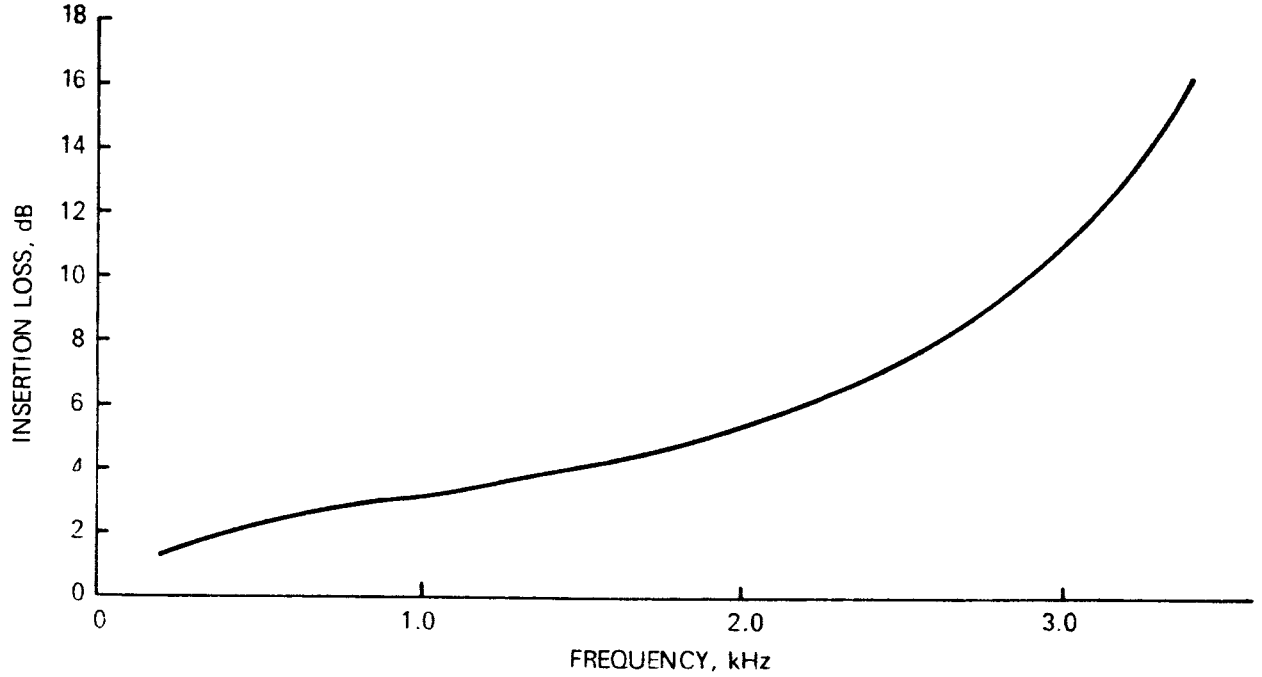


FIG. 5/5. TEST NETWORK A. 600Ω RESISTIVE TERMINATIONS



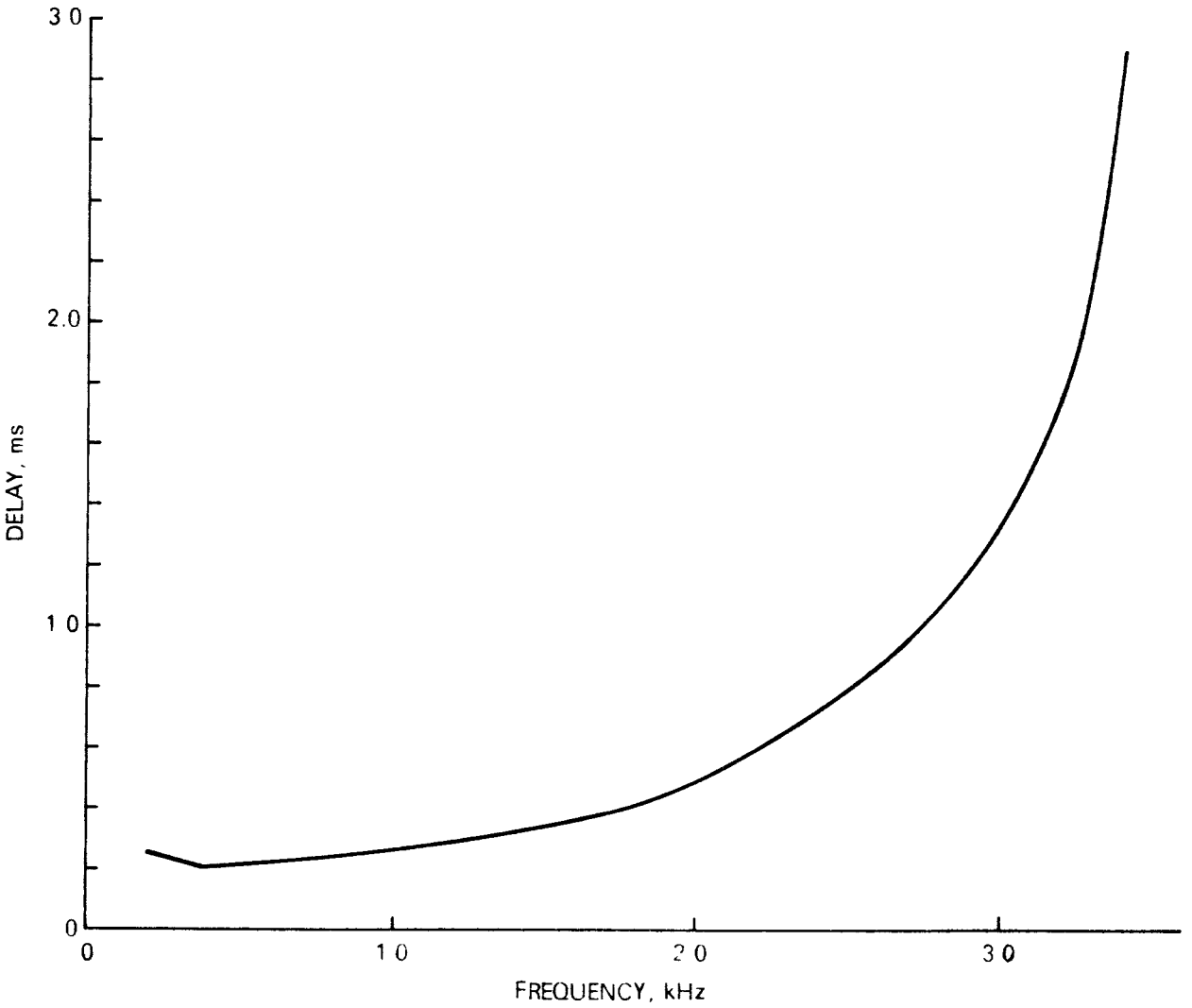


FIG. 5/6. TEST NETWORK B. 600 Ω RESISTIVE TERMINATIONS

APPENDIX 6

Future Facilities

The following coding proposals do not form an essential part of the basic Viewdata system. The intention is to implement them as soon as the need for them is clearly defined.

No two codes from column 3b defined below will be transmitted in any 20 ms period.

A6.1 Programming of Telephone Numbers and Identity Code

Programming data will be sent down the telephone line from the Viewdata User Control Centre for terminals having internal programming capability. When a new terminal is installed the user or dealer will call the Centre and give name, address, telephone number and any necessary information about the set eg. manufacturer, type number etc.

The centre will call the user back (to verify the telephone number) ask the user to put the terminal on-line and start the programming routine. After the programmed numbers have been checked by the centre the terminal will be ready for use.

The Programming Routine is entered by a 4 character sequence ESC 1 ESC 2.This puts the terminal into Programme-Verify mode (see fig A6.1). The memory is divided into seven 16-character blocks.An index block command ESC 3 is used to index through the blocks. Default is block 1 at entry to Programme-Verify mode.After a number (0-6) of index block commands,Verify mode may be selected by ENQ,or Programme mode may be selected by ESC 4.

Entry of Verify mode shall cause the terminal to transmit down the telephone line the contents of the current block (excluding any space-filling characters) at 75 bit/s and then revert to normal mode.

Programme data shall follow ESC 4 using the numbers 0-9 for the Identity Code and the codes given below for telephone numbers. Character 3/15 (?) will be used as a space-filling character after valid data characters to make the total number of characters in a block equal to 16.After receiving these 16 characters the terminal reverts to normal mode.

Any parity error or any character not defined in the above sequences (except NUL which may occur at any time in asynchronous transmissions) shall cause the terminal to revert to normal mode.During Programme mode,writing into the display memory shall be inhibited.

The code 3/14 (>) shall be reserved for private use in the context of autodialler codes.

Dialler Codes

DIALLED DIGIT	RECEIVED ISO 7 CHARACTER
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
0	:
PAUSE	;
RESERVED	>
SPACE FILLER	?

Other means of programming and storing the Identity Number and Telephone Numbers may be used by prior arrangement with the Post Office.

A6.2 Peripheral Control Codes.

DC2(1/2) and DC3(1/3) will be used to switch on and off respectively an as yet unspecified peripheral device.

3b/5 to 3b/7 will be used for the control of a tape recorder.

STX(0/2) will precede data to be used for local computing.The format will be defined by the Program Provider. It is recommended that STX should be used three times to prevent spurious mode change being caused by line noise.

The programming language and error checking protocols shall be defined by the user.After checking the data the terminal shall respond with # (to ask for the next block) or *00 (to ask for a retransmission).

A6.3 Tape Recorder Control Codes

Control characters will be used to facilitate loading of multiple pages onto magnetic tape. A Start code (ESC 6) will be sent to start the recorder and data will be sent after a pause of at least 1 second. A pause on playback character (ESC 7) will be sent after each frame to allow convenient reading of the data. This will cause suitably equipped recorders to stop and await a manual restart. A Stop character (ESC 5) will be sent at the end of the data to be recorded. The end of the sequence shall be defined by the manufacturer. Data format of the tape will not be defined.

A6.4 Alternative Alphabets for Foreign Languages

The following coding system allows several alphabet sets to be used.They are:

(1) The G0 set.This is the basic set in "normal" use.

(2) The G1 set.This is accessed by Shift Out (SO).

(3) The G2 set.Individual characters may be selected singly by the use of SS2.

(4) The G3 set.As G2 but SS3 is used.

A6.4.1 The G0 Set. If other alphabet sets are required to be designated as the G0 set then a 3 character escape sequence ESC,2/8,(F) or ESC,2/12,(F) will be used to define the set in use where (F) is a chacacter which defines one of 126 separate character sets. The G0 set is selected by Shift In (SI 0/15) or by initial Power-Up and remains selected until S0 (0/14) is received.

A6.4.2 The G1 Set. Alternative alphabets or other sets of special characters may be designated as the G1 set by the use of the escape sequence ESC,2/9,(F) or ESC,2/13,(F).The G1 set is selected by Shift Out(SO,0/14) and remains selected until SI is received.

A6.4.3 The G2 Set. The G2 set allows single characters from a set of 94 special symbols and accented characters to be called up by the use of Single Shift 2 (SS2,1/12).This assigns to the single following character the meaning of a character from the G2 set. Its use does not affect the current shift status (SI/SO).Figure A6.2 shows the primary G2 set.

A6.4.4 The G3 Set. The G3 set is similar in operation to the G2 set but Single Shift 3 (SS3,1/13) is used to select it. Where more than one G2 or G3 set is required an escape sequence ESC,2/10,(F) or ESC,2/14,(F) shall define one of the 126 sets. Figure A6.3 shows the primary G3 set.

The characters SO,SI,SS2,SS3 should not occupy a display position.The terminator (F) is a column 4-7 character. Figure A6.4 illustrates the methods of code extension described above.

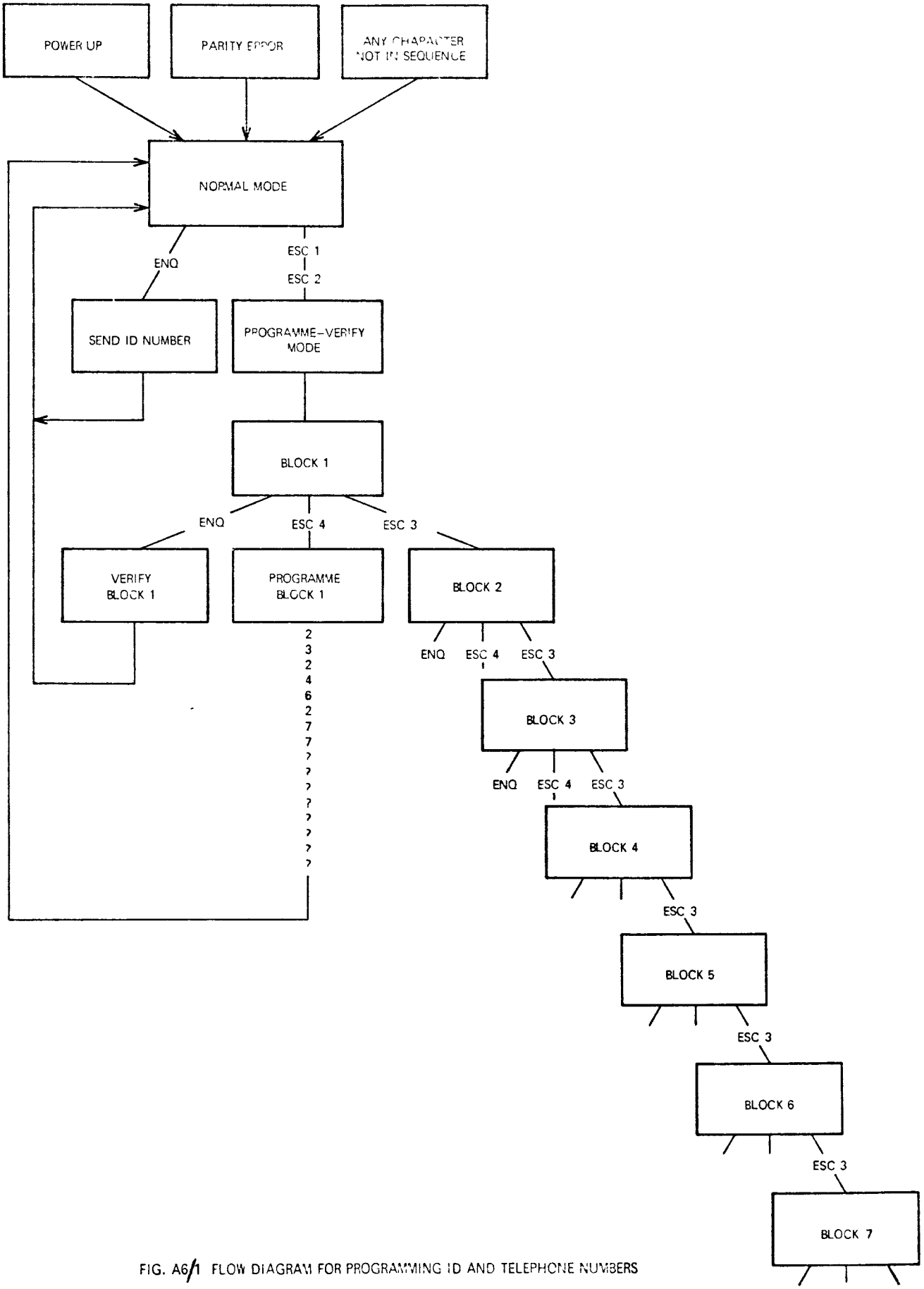


FIG. A6/1 FLOW DIAGRAM FOR PROGRAMMING ID AND TELEPHONE NUMBERS

G_2

	2	3	4	5	6	7
0	SP	ß	Á	İ	á	ı
1	Ç	ç	À	Ó	à	ó
2	Đ	đ	Â	Ò	â	ò
3	Ğ	ğ	Ä	Ô	ä	ô
4	Ij	ij	Å	Ö	å	ö
5	Ñ	ñ	Ã	Õ	ã	õ
6	Þ	þ	Ă	Ö	ă	ö
7	Ş	ş	Æ	Ø	æ	ø
8	Ţ	ţ	É	Œ	é	œ
9	Ŵ	ŵ	È	Ú	è	ú
10	Ŷ	ŷ	Ê	Ù	ê	ù
11	Ý	ý	Ë	Û	ë	û
12			Í	Ü	í	ü
13			Ì	Ü	ì	ü
14			Î		î	
15	İ	¿	Ï		ï	DEL

FIG A6/2

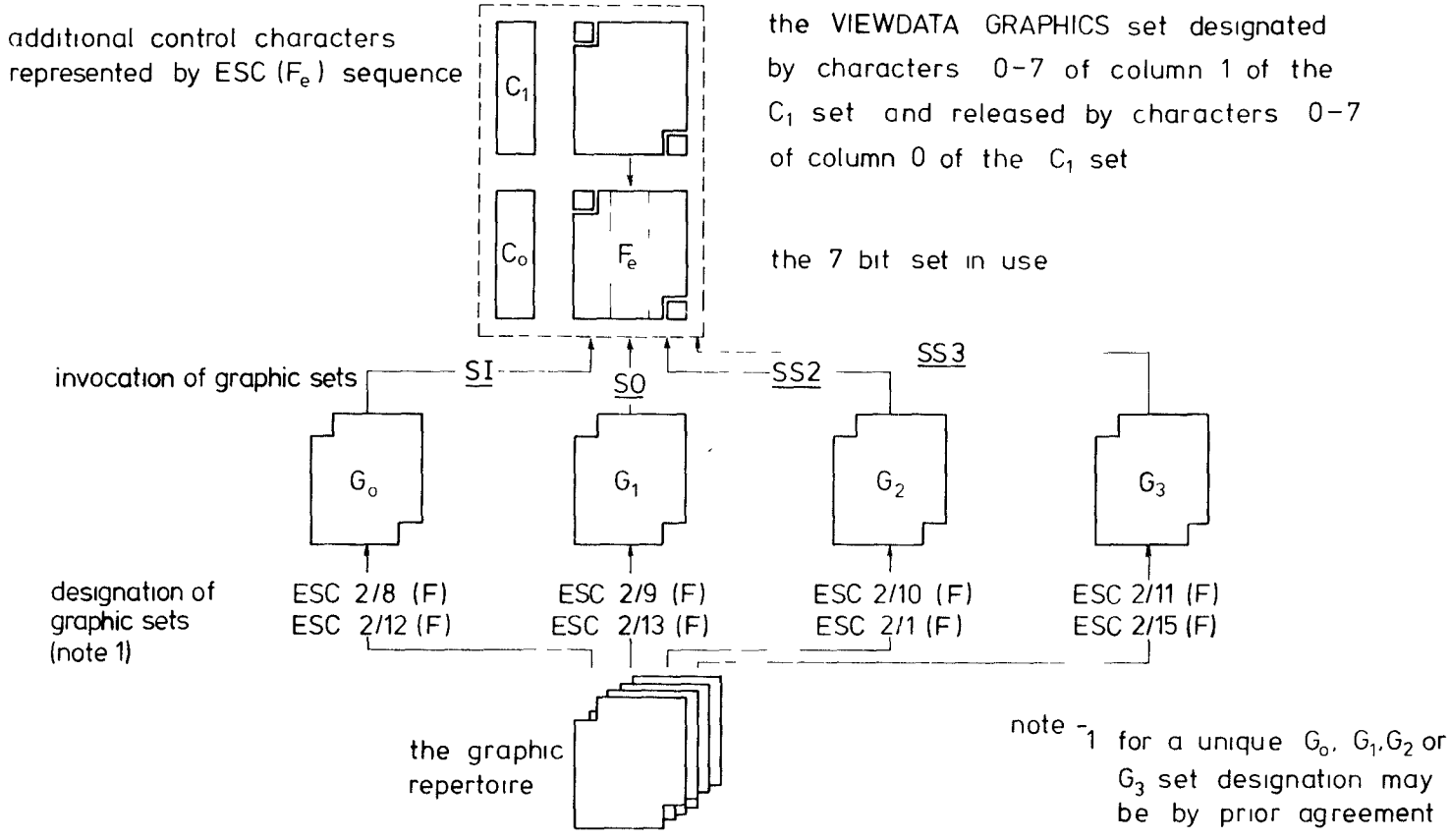
G_3

	2	3	4	5	6	7
0	SP	ß	Á	Ý	á	ý
1	Č	č	Ą	Ó	ą	ó
2	Ć	ć	Â	Ċ	â	ċ
3	Đ	đ	Ä	Ô	ä	ô
4	Ǵ	ǵ	Å	Ö	å	ö
5	Ķ	ķ	Ā	Ž	ā	ž
6	Ļ	ļ	Ħ	Ż	ħ	ż
7	Ł	ł	Æ	Ź	æ	ź
8	Ņ	ņ	É	Ġ	é	ġ
9	Ň	ň	Ę	Ú	ė	ú
10	Ń	ń	Ê	Ų	ě	ų
11	Ŕ	ŕ	Ē	Ū	ē	ū
12	Ř	ř	Ę	Ů	ę	ů
13	Ś	ś	Í	Ŗ	í	ŗ
14	Š	š	Į		į	
15	Ŧ	ŧ	Ī		ī	DEL

FIG A6/4

STRUCTURE OF CODE EXTENSION

Viewdata Transmission Codes



APPENDIX 7

Keyboard and Tape Recorder Connectors

In view of the possible existence on some Viewdata terminals of sockets for both external keyboards and tape recorders it would seem desirable that these connectors should be mutually incompatible to prevent damage to either device. Recognising the low cost of DIN type connectors the following new standard is recommended for the keypad interface. Its adoption is not mandatory but would facilitate the production of 'standard' Viewdata keyboards.

Keyboard plug; 6 pin DIN e.g. RS Components type 478 021
Terminal socket; 6 pin DIN e.g. RS Components type 478 295

Connections	Pin No.	Function
	1	0 volts
	2	+5 volts
	3	-12 volts
	4	no connection
	5	TTL data

Tape Recorder plug; 5 pin 180 DIN e.g. RS Components type 477 876

NB All external equipment connected to the Prestel terminal will require PO evaluation in accordance with paragraph 7.8 of this specification.